Helix™

HELIX UNIVERSAL SERVER ADMINISTRATION GUIDE

Helix™ Universal Server version 9.0

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SUMMARY OF CONTENTS

PART VIII: APPENDIXES

CONTENTS

PART II: GETTING STARTED

PART III: STREAMING CLIPS

INTRODUCTION

Welcome to Helix™ Universal Server version 9.0, the most powerful server software available for streaming media files across an intranet or the Internet. This manual will help you use and optimize Helix Universal Server for real-time delivery of media files.

What is Helix?

Helix™ from RealNetworks is a universal digital media delivery platform. With industry-leading performance, integrated content distribution, advertising, user authentication, Web services support, and native delivery of RealMedia, Windows Media, QuickTime, and MPEG-4, Helix from RealNetworks is a robust digital media foundation that meets the needs of enterprises and networking service providers.

Audience for this Guide

This guide is intended for technical system administrators who will manage Helix Universal Server and its activities, but not necessarily create the content that's streamed. Content creation information is available in a companion book, the *RealNetworks Production Guide*. Information services professionals, server administrators, Web masters, and others who provide Web pages for the Internet and for intranets may also find this book useful.

> **Tip:** *Helix Universal Server Administration Guide* is also available online at **http://service.real.com/help/library/index.html**.

How this Guide Is Organized

This administration guide contains the following chapters and appendixes.

Chapter 1: New Features

If you're familiar with previous versions of RealSystem Server, this chapter will give you a quick update on the new features found in Helix Universal Server.

Chapter 2: Overview

This chapter presents the "big picture" of how Helix Universal Server works with a Web server to stream media to client software such as RealOne Player.

Chapter 3: Installation and Quick Start

Find out how to install and start Helix Universal Server, and how to use the Web-based administration tool, Helix Administrator.

Chapter 4: Server Setup

This chapter covers the basic Helix Universal Server configuration options involving addresses, ports, and licenses. Most options are configured at installation and may need no changing.

Chapter 5: Clip Delivery

This chapter describes on-demand streaming features, and explains how to construct links to your streaming media clips.

Chapter 6: Multiple Servers

This chapter covers several features that you can use on a large network, including redundant servers, content caching, and proxy servers.

Chapter 7: Unicasts

Read this chapter to learn how to broadcast and archive live events in RealMedia, Windows Media, QuickTime, and other formats.

Chapter 8: Multicasts

This chapter discusses multicasting, which sends a single, live stream to multiple clients, rather than a separate stream to each client. Clients connect to this stream rather than to the Helix Universal Server computer.

Chapter 9: Transmitters and Receivers

Splitting is a method of server-to-server communication. This communication can be between two or more servers, or between Helix Producer and Helix Universal Server. Splitting enables you to distribute broadcasts broadly.

Chapter 10: Simulated Live Broadcasts

This chapter explains how to deliver archived or other on-demand content as if it were a live broadcast.

Chapter 11: Firewalls

If you're streaming media to users on the Internet, you'll need to know how Helix Universal Server and other RealNetworks products interact with firewalls. This chapter provides detailed information on the ports Helix Universal Server requires for various server feature configurations.

Chapter 12: Access Control

This chapter shows you how to limit access to Helix Universal Server through the IP addresses of clients attempting to connect.

Chapter 13: Authentication

You can control and limit who can view your content. This chapter describes the different Helix Universal Server authentication methods.

Chapter 14: ISP Hosting

If you're an Internet service provider (ISP), you can host streaming media on behalf of your customers. This chapter explains how.

Chapter 15: Targeted Ads

You can have Helix Universal Server automatically insert advertisements into presentations. This chapter describes the many options available within this feature.

Chapter 16: Access and Error Logs

If you want to look at trends, and see what content is most popular, Helix Universal Server offers basic reporting functionality.

Chapter 17: Custom Logging

Helix Universal Server includes advanced reporting functionality that can report on many aspects of Helix Universal Server operation, from server health to client connections.

Chapter 18: Activity Monitors

To provide the highest possible quality of service, you'll want to keep track of how many people request media from your Helix Universal Server. This chapter describes the features available in the monitoring utility.

Appendix A: Configuration File

This appendix presents a discussion on basics, editing guidelines, and XML syntax used in the Helix Universal Server configuration file.

Appendix B: Address Space Bit Masks

This appendix explains how to identify a range of IP addresses by assigning a bit mask to a 32-Bit IP address. A number of Helix Universal Server features can use these bit masks.

Appendix C: Authentication Data Storage

Helix Universal Server comes with different methods for tracking authentication information, as described in this appendix. You can use this data for billing purposes, or to track who's watching what.

Conventions Used in this Manual

This section explains some conventional terms and formats used throughout the book.

Terminology

- Because this manual is aimed at the Helix Universal Server administrator, the term "you" refers to the administrator. Those who play clips served by Helix Universal Server are referred to as "visitors," "viewers," or "users."
- RealNetworks clients, such as computers running RealOne Player, are referred to generically as "clients". Wherever information applies specifically to RealOne Player, this is clearly stated.

  Note: Although most clients currently in use are computers running RealPlayer or RealOne Player, RealNetworks also makes a software development kit (SDK) that enables other companies to develop their own players with which they can use to receive the various types of streamed data.

- RealNetworks production tools, which are used to create the files and data that Helix Universal Server streams, are referred to collectively as "encoders."
- "Clips," "content," "media files," "files", and "presentations" are used interchangeably to indicate the material that Helix Universal Server streams.

Typographical Conventions

The following table explains the typographic conventions used in this manual.

Notational Conventions

Convention	Meaning
`syntax`	This font is used for syntax of configuration files, URLs, or command-line instructions.
`variables`	Italic text represents variables. Substitute values appropriate for your system.
emphasis	Bold text is used for emphasis.
. . .	Ellipses indicate nonessential information omitted from examples.
[ ]	Square brackets indicate optional material. If you choose to use the material within the brackets, don't type the brackets themselves. An exception to this is in the access log, where statistics generated by the `StatsMask` variable are enclosed in regular brackets.

Sample Links

Links that point to Helix Universal Server take the following form:

```
helixserver.example.com
```

where:

- *helixserver* is a placeholder for the name of the computer on which you are running your Helix Universal Server. Substitute the name of your organization's Helix Universal Server computer wherever you see this syntax.
- `example.com` is a placeholder for a domain name. Substitute the domain name of your organization's computers wherever you see this syntax.

Default Locations and Values

In all of the examples given in this book, it's assumed that you've installed Helix Universal Server in the default location for your operating system and that you're using default values for all settings. Of course, you can customize Helix Universal Server however you want to meet your specific needs. Default values are used here for clarity of illustration. On Windows-based platforms, the default installation directory is:

```
C:\Program Files\Real\Helix Server
```

Additional Resources

In addition to this manual, you may need one or more of the following RealNetworks resources, which are available at **http://service.real.com/help/library/index.html**.

- Helix Universal Server Readme File

  This file contains supplemental information not covered in this guide. To view this guide, click **Readme** in Helix Administrator.

- *RealNetworks Production Guide*

  This manual explains the basics of creating streaming clips. You'll learn how to calculate bandwidth needs, and how to put a multimedia presentation together.

- *Helix Universal Proxy Administration Guide*

  If you're using Helix Universal Proxy, or are working with someone who is, this manual describes the use of Helix Universal Proxy and configuration information.

PART

I

HELIX UNIVERSAL SERVER BASICS

If you're an old hand with RealSystem Server, use this section to find out about new features in Helix Universal Server. If you're new to this technology, this section gives you an overview of how Helix Universal Server works.

CHAPTER

1

NEW FEATURES

The Helix™ Universal Server version 9.0 architecture facilitates extensibility and interoperability with third-party solutions. This chapter describes new features in Helix Universal Server, and covers upgrade issues from previous versions of RealSystem Server.

New Features in Helix Universal Server 9.0

The latest version of Helix Universal Server introduces the following features.

Aliasing

Aliases are substitutions for actual file names and directory paths used in URLs. Using an alias, the Helix Universal Server administrator can mask actual resources in published URLs, as well as shorten and simplify published URLs. For more information, see "Setting Up Aliases" on page 84.

Content Caching

Content caching enables two or more Helix Universal Servers to transfer prerecorded media files dynamically, providing two key benefits. First, caching improves playback quality by propagating the content closer to the viewer. Second, it reduces delivery cost by caching content at the network's edge. For more information, see "Content Caching" on page 96.

Custom Logging

Custom logging is a flexible system for generating reports. It is based on templates that define what information should be captured, when and how often it should be captured, and how it should be delivered. You can use default templates or create your own templates. For more information, see Chapter 17.

SLTA

SLTA is RealNetworks' next-generation tool for streaming a prerecorded clip as a live event. SLTA streams more media formats than its predecessor, G2SLTA. It provides a more robust way of delivering streams, acting as a transmitter that splits a stream to a Helix Universal Server receiver. For more information, see Chapter 10.

RTSP Cache Directives

By default, a proxy may cache or split all on-demand content and live broadcasts hosted on Helix Universal Server. You may not want this in some cases, though. The RTSP cache directives feature gives you full control to define directives for on-demand content and live broadcasts that prohibit proxy devices from caching or splitting streaming media. For more information, see "Restricting Proxies from Caching or Splitting Content" on page 109.

Redundant Servers

This feature enables you to add a level of redundancy to content delivery. By default, RealOne Player attempts to reconnect to the originating Helix Universal Server if the RTSP connection breaks. However, you can specify an alternate server that RealOne Player contacts instead. For more information see, "Implementing Redundant Servers" on page 93.

Windows Media Streaming

Helix Universal Server can stream the Windows Media format to Windows Media Player using either MMS (Microsoft Media Services protocol) or HTTP. It can also connect to Windows Media Encoder through HTTP, allowing you to transmit (split) a Windows Media broadcast to other Helix Universal Servers. Thus, you can have a homogeneous streaming network that delivers multiple file formats, including RealMedia, Windows Media, and QuickTime.

MPEG Streaming

Helix Universal Server delivers MPEG-1, MPEG-2, MP3, and MPEG-4 content. For details, see "MPEG Audio and Video" on page 19.

SureStream Splitting

Helix Universal Server helps you conserve bandwidth when splitting a live RealAudio or RealVideo broadcast. With splitting, you typically send multiple bit rate streams from the transmitter to the receiver, regardless of whether clients using the stream require each of the different bit rates. With SureStream-aware splitting, only the bit rates requested by the client are actually sent over the network to the receiver. For more information, see "SureStream-Aware Splitting" on page 167.

RealOne Player Statistics

The new client statistics type 4 gather playback information specifically for RealOne Player, including packet and bandwidth information for each stream, as well as the results of using TurboPlay. For more information, see "Statistics Type 4" on page 351.

Features Introduced in Version 8

This section describes the features that were added in RealSystem Server version 8, and are included in Helix Universal Server version 9.0.

Distributed Licensing

This feature enables a set of Helix Universal Servers within an organization to use the same license file. It allows you to configure features independently on individual Helix Universal Servers while sharing a pool of connections. For more information, see "Distributing Server Licenses" on page 67.

Port Hinting

For clients that can receive Helix Universal Server content only through "HTTP cloaking," you can create URLs that list the server ports to try. This way, the client doesn't waste time by trying to discern the correct port to use. For more information, see "Handling Communication through Nonstandard Ports" on page 61.

Redundant Encoders

You can now use parallel sources as input for Helix Universal Server. Should one stream become unavailable, Helix Universal Server automatically switches

all users to the next available stream. For more information, see "Using Broadcast Redundancy" on page 122.

Splitting

The redesigned splitting feature provides greater scalability and reliability. Most notably, multicasting between transmitter and receiver is now possible. If you've used splitting in earlier versions of RealSystem Server, see "Upgrades from RealServer 7 or Earlier" on page 12 for more information.

Support for QuickTime and Additional Data Types

Helix Universal Server 8 (and 9) support even more data types than before, such as MPEG Audio (MP3) and Macromedia Flash version 4. QuickTime version 4 and higher files can be streamed to Apple's QuickTime 4 and higher player.

Upgrade Issues

The following sections explain issues with upgrading to Helix Universal Server from an earlier version of RealSystem Server.

Compatibility with Version 8

There are no known compatibility issues between Helix Universal Server and RealSystem Server version 8. This means that you can use a version 8 configuration file with Helix Universal Server. In this case, no features new in Helix Universal Server are enabled, but no existing feature are disabled. This allows you to migrate to a new version by installing the new version, using your old configuration file, and activating new features on an as-needed basis.

> **Tip:** RealNetworks recommends using identical versions of server products for server-to-server feature like splitting.

Upgrades from RealServer 7 or Earlier

Helix Universal Server is fully compatible with RealServer 3 through 7, with the exception of the splitting feature. Because of the many changes to the splitting feature from version 8, all nodes along the stream—transmitter, relay, and receiver—must run Helix Universal Server. If you are moving from a RealServer 7 or earlier product, note that links used for splitting have

completely changed. Keep in mind that a source is now called a *transmitter*, and a splitter is now called a *receiver*.

For More Information: See "Linking to Split Content" on page 187.

Default Installation Directory

On Windows, Helix Universal Server installs into the following default location, which differs from the installation paths for previous versions of RealSystem Server:

`C:\Program Files\Real\Helix Server`

If you choose the default location, you'll need to move your existing content to the new directory tree, as described in "Upgrading in a Different Directory" on page 39.

Legacy Bandwidth Negotiation

Before the introduction of SureStream RealAudio and RealVideo, bandwidth negotiation was handled by creating one file for each available bandwidth, and placing all of the files in a directory that ended with `.rm`. Files were named according to the compression algorithm used to encode them. If you have upgraded from an earlier version of RealSystem server that used the older style of bandwidth negotiation, your new Helix Universal Server still reads the old directory structure and can perform the bandwidth negotiation automatically.

CHAPTER

2

OVERVIEW

Designed for powerful and flexible media delivery, Helix™ Universal Server version 9.0 streams the widest variety of media, such as audio, video, animation, images, and text, to the broadest range of media players, including RealOne Player, Windows Media Player, and Apple QuickTime Player. If you are new to Helix Universal Server, this chapter introduces you to Helix Universal Server concepts and features.

Media Formats

Helix Universal Server can stream on-demand clips and broadcast live events in more media formats than any other media server. Depending on its license, Helix Universal Server can serve the file formats listed below. Although not exhaustive, the following list represents the major media formats available with Helix Universal Server, which can deliver additional formats through plug-ins created by third-party developers.

RealNetworks:	RealAudio (`.rm`), RealVideo (`.rm, .rmvb`), RealPix (`.rp`), RealText (`.rt`)
Macromedia:	Flash (`.swf`)
Microsoft:	Windows Media (`.asf`, `.wma`, `.wmv`)
Apple:	QuickTime (`.mov`)
Standards-Based:	MPEG-1, MPEG-2, MPEG-4, MP3
Image Formats:	GIF (`.gif`), JPEG (`.jpg`, `jpeg`), PNG (`.png`)
Other:	AU (`.au`), AIFF (`.aif`, `.ief`), WAV (`.wav`)

Helix Universal Server can deliver the same media formats on any of its supported operating systems, which include Windows and many UNIX variants such as Linux. This allows you to stream the media formats you want, using the operating system of your choice. Helix Universal Servers running on different operating systems are completely interoperable, allowing you to

deliver homogeneous media services in a heterogeneous network environment.

Tip: To determine if Helix Universal Server can stream a clip, open the clip in RealOne Player from your desktop. If RealOne Player can play the clip, Helix Universal Server typically can deliver it, as long as the clip is in a streaming format rather than a format designed for download. Note, however, that Helix Universal Server can also stream clips that RealOne Player does not play.

For More Information: The specific versions of media formats and media players supported by Helix Universal Server are subject to change. Check **http://www.realnetworks.com/resources** for the latest information.

RealMedia

Helix Universal Server streams RealAudio, RealVideo, RealText, RealPix, and SMIL (1.0 and 2.0) to RealOne Player and earlier versions of RealPlayer. It supports all past codecs and file formats, meaning that you can deliver any existing RealMedia clip with the current version of Helix Universal Server.

SureStream RealAudio and RealVideo

Because different viewers have different streaming bandwidths available to them, RealAudio and RealVideo clips can use SureStream technology to encode multiple streams at different bandwidths in a single clip. When a RealPlayer requests a clip, Helix Universal Server delivers the stream suited for that player's connection speed. This way, each viewer receives the highest-quality stream possible. In addition, Helix Universal Server and the player can switch between streams to compensate for changing network conditions.

For More Information: For instructions on encoding SureStream RealAudio and RealVideo clips, see *Helix Producer User's Guide*. See also the audio and video chapters of *RealNetworks Production Guide*.

SMIL

For media streamed to RealOne Player, the content creator may use Synchronized Multimedia Integration Language (SMIL) to coordinate multiple clips into a single presentation. A SMIL file, which has the file extension `.smil`, uses XML-based markup to lay out and time any number of clips played together or in sequence. It can also open HTML pages in RealOne Player, and create special effects such as fades during clip transitions. RealPlayer G2 through RealPlayer 8 can play SMIL 1.0 files. RealOne Player supports SMIL 1.0 and 2.0.

For More Information: See *RealNetworks Production Guide* for instructions about using SMIL.

RealPix

Using RealPix, you can stream slideshows composed of still images in GIF, JPEG, or PNG formats. The RealPix markup language includes special effects, letting you fade between images, for example, or zoom in on an image detail. You can even use SMIL to coordinate your slideshow with a streaming soundtrack.

For More Information: *RealNetworks Production Guide* contains a chapter on producing RealPix slideshows.

RealText

With RealText, you can create timed text clips that can stream alone or in combination with other media such as audio or video. This makes RealText a handy means for adding text to SMIL presentations. Using RealText, you can add subtitles to a video, for example, or provide closed-captioning.

For More Information: See the RealText chapter in *RealNetworks Production Guide*.

Macromedia Flash

RealPlayer 8 and RealOne Player support Macromedia Flash version 4, 3, and 2. Earlier versions of RealPlayer support Flash version 2. Flash is well-suited for linear presentations that have a continuous audio track and animated images synchronized along a timeline. Such presentations can include demonstrations, training courses, product overviews, and movie trailers.

For More Information: Learn more about Flash from Macromedia's Web site at **http://www.macromedia.com/software/flash**. See the Flash animation chapter in *RealNetworks Production Guide* for information about streaming Flash to RealOne Player.

Windows Media

Helix Universal Server can stream Microsoft Windows Media audio and video to Windows Media Player versions 6.4 and later. Helix Universal Server supports the MMS protocol, as well as Microsoft's multiple bit rate (MBR) encoding technology. It can receive live streams from the Windows Media Encoder for unicasting and multicasting. Windows Media formats do not stream to RealOne Player.

For More Information: For information about producing clips or live broadcasts in the Windows Media format, visit **http://www.microsoft.com/windows/windowsmedia/default.asp**.

QuickTime

Helix Universal Server can stream hinted QuickTime clips to Apple's QuickTime Player 4 and later. It can deliver QuickTime clips encoded in all major proprietary and standards-based codecs, including Sorenson, Cinepak, Qualcomm PureVoice, and Qdesign. Helix Universal Server can stream live QuickTime broadcasts from Sorenson Broadcaster, as well as simulated broadcasts from Playlist Broadcaster and the Helix Universal Server SLTA utility.

For More Information: For QuickTime information, visit Apple's Web site **http://www.apple.com/quicktime/**. For more about Sorenson tools, visit **http://www.sorenson.com**.

Note: If you encode a QuickTime clip with a standards-based codec, such as h.261, h.263, or MP3, you can also stream the clip to RealPlayer 8 and higher. RealNetworks media players do not play QuickTime clips encoded with proprietary codecs such as Sorenson, however.

MPEG Audio and Video

Helix Universal Server streams the standards-based MPEG formats, including MPEG-4 and MP3, which is the audio layer of the MPEG-1 format. Helix Universal Server accepts requests for streaming MPEG content over the RTSP control protocol, and can deliver the stream to any client that supports the RTP packet format. RealOne Player plays most of the supported MPEG formats.

- MPEG-1

  Helix Universal Server delivers ISO/IEC 1172 compliant video and system bit streams over RTSP/RTP. RealOne Player and QuickTime Player, for example, can play MPEG-1 streams. Helix Universal Server delivers MPEG-1 content with file extensions of `mpa`, `mpg`, `mpeg`, `mpv`, `mps`, `m2v`, `m1v`, and `mpe`.

- MPEG-2

  Helix Universal Server delivers ISO/IEC 13818 compliant video and program bit streams over RTSP/RTP. ISO/IEC 13818 compliant transport bit streams are not supported. Although RealOne Player does not play the MPEG-2 format, you can use Helix Universal Server to stream MPEG-2 to any player or device that has licensed the rights to play MPEG-2.

- MPEG-4

  Helix Universal Server streams hinted MPEG-4 content over RTSP/RTP. It delivers ISMA/3GPP compliant bit streams, and you can view MPEG-4 bit streams using any ISMA/3GGP compliant client that supports RTSP/RTP, such as RealOne Player, RealOne Mobile Player, and Apple QuickTime Player 6. MPEG-4 clips commonly use the file extension `mp4`.

  For More Information: There are many MPEG resources available. The official home page for the MPEG working group is **http://mpeg.telecomitalialab.com/index.htm**.

RTP-Delivered Formats

Helix Universal Server includes broad support for the standards-based RTP packet format, which is used by default with QuickTime and MPEG, and optionally with RealMedia. This allows Helix Universal Server to deliver on-demand clips or live broadcasts for virtually any media type that streams over the RTSP control protocol and the RTP packet format.

For More Information: The section "Packet Formats" on page 229 explains RTP.

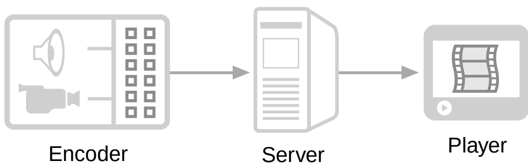
Encoding Tools

Helix Universal Server delivers clips and live streams, but does not create them. The following sections explain the encoders and production tools that you can use with Helix Universal Server.

Streaming Media Encoders

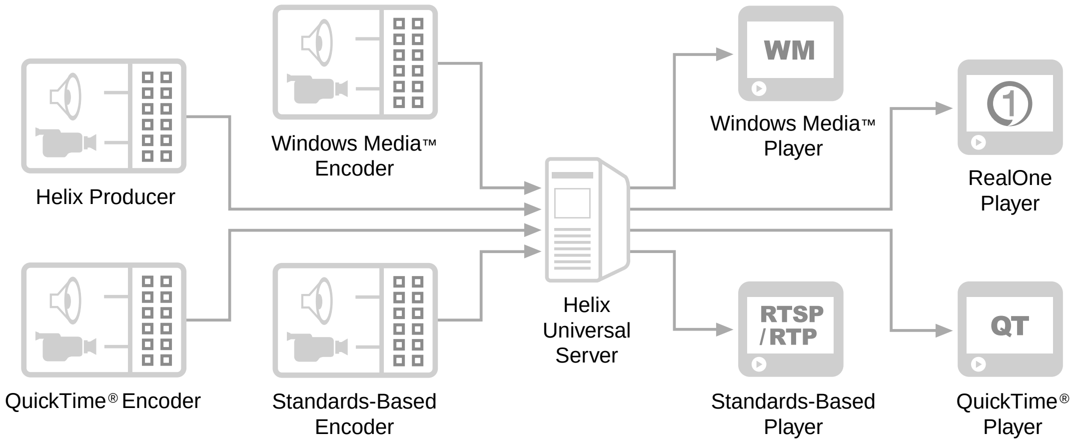
For delivering on-demand clips, the three major steps are encoding a clip with an encoding tool, streaming a clip through Helix Universal Server, and playing a clip with a media player. Many encoders also accept live input, encoding it as a stream that is sent to Helix Universal Server for live broadcast without being saved as a streaming clip first.

Encoding, Streaming, and Playing



For each media type, you use a specific tool (or family of tools) to encode audio and video as a streaming clip or live broadcast. Helix Producer, for example, turns files in formats such as AVI, WAV, and uncompressed QuickTime into RealAudio and RealVideo clips. It can also encode live input from a camera or microphone. Tools like Microsoft Windows Media Encoder and Sorenson Broadcaster can encode audio and video input for streaming to Windows Media Player and the QuickTime Player, respectively.

Universal Media Encoding and Delivery



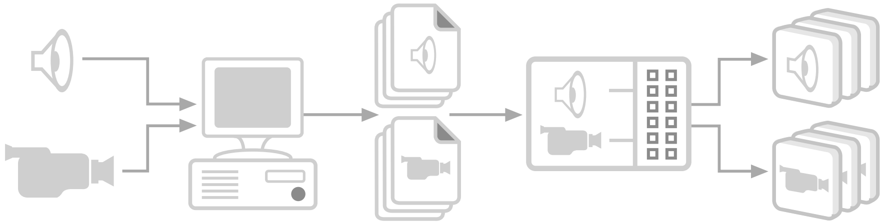
Tip: This manual uses the generic term *encoder* to refer to any software that creates live streams or prerecorded clips in a format that Helix Universal Server can deliver.

For More Information: *Helix Producer User's Guide* explains how to encode RealAudio and RealVideo clips.

Production Tools

Encoding a media clip or broadcast is the last step of a process that involves capturing, digitizing, editing, and optimizing audio or video data. A streaming media author uses various production tools to accomplish these jobs. These tools typically include video cameras, microphones, recording media such as tapes or CDs, mixing hardware, and audio and video editing software. You can use any tools you want to capture and edit audio and video input. You just need to ensure that your tools can save digitized files in formats that your encoding tools can accept.

Production Process for On-Demand Clips



For More Information: *RealNetworks Production Guide* contains a presentation planning chapter that explains these basic steps. See also that guide's audio and video chapters for tips on capturing and editing digital media.

Streaming Protocols

Helix Universal Server streams media to clients over internal networks and the public Internet. Although Helix Universal Server can deliver HTML pages, it's usually employed along with a separate Web server to coordinate the delivery of HTML pages and streaming media. The following sections summarize the supported communications protocols. For details, see "Protocol Layers" on page 226.

Real Time Streaming Protocol (RTSP)

RTSP is a standards-based streaming media protocol endorsed by the Internet Engineering Task Force (**http://www.ietf.org/**). It enables Helix Universal Server to communicate with all versions of RealPlayer starting with RealPlayer G2, as well as the QuickTime Player and any RTSP-based MPEG player. Helix Universal Server also supports the RTP packet protocol, the standards-based companion to the RTSP control protocol.

Progressive Networks Audio (PNA)

PNA is an older, proprietary protocol used in earlier versions of RealSystem Server and RealPlayer. Helix Universal Server and RealOne Player still support PNA for backward compatibility with earlier players and servers. Starting with

RealPlayer G2, all RealNetworks servers and clients use RTSP as their primary protocol.

Microsoft Media Services (MMS)

MMS is a proprietary control protocol used by Helix Universal Server to communicate with Windows Media Player.

HyperText Transfer Protocol (HTTP)

Although HTTP is not a streaming media protocol, Helix Universal Server uses HTTP in a number of ways. For example, it uses HTTP to deliver the Helix Administrator HTML pages that allow you to configure and run Helix Universal Server.

On-Demand Streaming

On-demand streaming is the most common method of delivering media. Comparable to rented videos, on-demand clips are available at any time. The media is digitized, encoded in a streaming format, and stored on Helix Universal Server. Each viewer who requests an on-demand clip receives a separate data stream from Helix Universal Server. The clip starts at its normal, encoded beginning, and each viewer can fast-forward, rewind, or pause the presentation independently.

Basic Streaming Features

After installation, Helix Universal Server requires no configuration to stream clips on-demand. You can simply place your clips in the main content directory, and link to them from a Web page. Chapter 5 explains how to write links to on-demand clips. It also explains some basic streaming features that you can use:

- “Adding a Mount Point for On-Demand Clips” on page 83 explains how to store clips anywhere on a network, defining mount points that indicate the clip location.
- You can create aliases to shorten long URLs or hide clip locations as described in “Adding a Mount Point for On-Demand Clips” on page 83.
- See “Browsing On-Demand Content” on page 87 to learn how to list all on-demand clips residing on Helix Universal Server.

- As described in "Displaying Source Information" on page 88, you can allow RealOne Player viewers to download a clip's encoding information, as well as see the markup for SMIL files.

Features for Multiple Servers

Several features help you to administer a large network that contains multiple Helix Universal Servers delivering on-demand content. Chapter 6 discusses these features, which include the following:

- Instead of having RealOne Player reconnect to the same Helix Universal Server if clip delivery is interrupted, you can point RealOne Player to a backup server, as explained in "Implementing Redundant Servers" on page 93.
- When you have a large network, you may want to replicate media assets across different Helix Universal Servers. The features described in "Content Caching" on page 96 let you do this.
- In addition to multiple Helix Universal Servers, your network can contain multiple Helix Universal Proxys. The section "Using a Media Proxy" on page 105 explains how you can control the content that a Helix Universal Proxy caches or splits.

Authentication and Access Control

Keeping your media assets secure is an important function of Helix Universal Server. To allow you to verify and control connection attempts, Helix Universal Server offers the following features:

- The features described in "Controlling Connections" on page 64 allow you to limit the number of simultaneous connections, or the amount of outgoing bandwidth.
- Chapter 12 explains how to associate connection rules based on IP addresses. These rules can allow or deny connections to specific protocol ports.
- Authentication, which Chapter 13 covers, verifies the identity of a user requesting streaming media. This verification can take the form of asking for a user name and password. Or, it can be entirely hidden from the viewer.

- For Internet Service Providers, Helix Universal Server works with existing user accounts and directory structures to make media files available for streaming. For each ISP account, you can allocate a minimum and maximum number of connections. Chapter 14 explains this feature.

Monitoring and Reporting

Helix Universal Server offers several features that allow you to monitor current connections, and view past information stored in a log file:

- From the access log, which Chapter 16 explains, you can create reports that enable you to see trends, gather information, or check on the status of your Helix Universal Server.
- Custom logging, as described in Chapter 17, allows you to customize logged information based on templates that you define.
- As described in Chapter 18, Helix Administrator includes a real-time tool that displays activity on your Helix Universal Server. The monitor displays information such as who's using your Helix Universal Server, the peak use times, and which files are requested the most.

Feature Availability

Depending on which Helix Universal Server product you use, some of the features described in this manual may not be available to you, or may be limited in some way. Consult your license file for a list of which features are enabled in your version of Helix Universal Server. If you'd like to augment your Helix Universal Server's capabilities, contact RealNetworks or your reseller.

For More Information: For instructions on reading license files with Helix Administrator, see "License File Information" on page 52.

Live Broadcasting

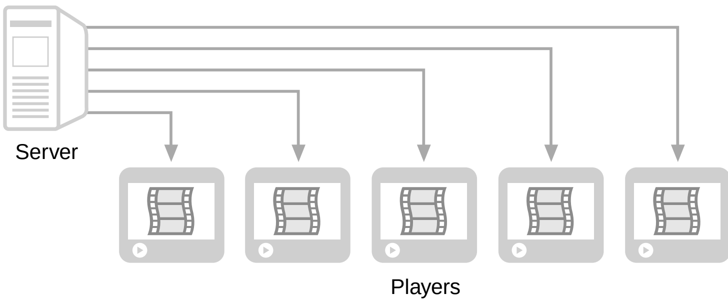
As with a live television event, a user can tune into a live Internet or intranet broadcast to join the presentation in progress. Because the event streams in real-time, the viewer cannot fast-forward or rewind through the broadcast. As the following sections explain, you can deliver live streams in several different ways, based on your needs and network capabilities.

Tip: Most of the features described previously for on-demand delivery, including URL aliases, authentication, access control, and monitoring, work for live broadcasts as well.

Unicasting

Unicasting, which Chapter 7 covers, is the simplest method of live broadcasting. It works with most supported media formats and requires little setup. In unicasting, a media encoder delivers a live stream to Helix Universal Server, which then delivers a separate broadcast stream to each media player. Because each player receives its own stream, unicasting is limited by your number of licensed client connections, as well as your outgoing bandwidth.

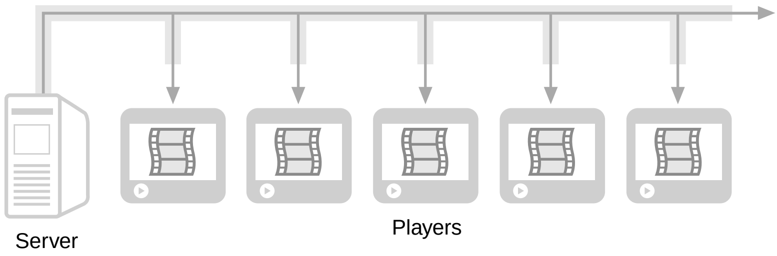
Unicasting



Multicasting

As explained in Chapter 8, multicasting dramatically reduces the bandwidth required for broadcasting, allowing many more viewers to participate. In a multicast, media players do not receive separate broadcast streams from Helix Universal Server. Instead, they all connect to the same stream (or streams). Multicasting requires a multicast-enabled network, however, and is primarily suited for intranets, although multicasting on the Internet is possible.

Multicasting



Helix Universal Server supports three kinds of multicasts:

- Back-channel multicasts maintain a low-bandwidth control channel between Helix Universal Server and RealOne Player, enabling Helix Universal Server to monitor how many players are connected. You can multicast any media format played by RealOne Player. In fact, you can make all unicasts simultaneously available as back-channel multicasts through the same broadcast hyperlink.
- Scalable multicasts do not maintain a control channel. Helix Universal Server does not monitor the number of connected players, but it can broadcast a single stream to any number of players. It can also direct players to send quality of service statistics back to it, or to a Web server, at the end of the broadcast. Helix Universal Server supports RTP-based media players that comply with scalable multicasting standards, including RealOne Player and QuickTime Player.
- Windows Media multicasts are scalable multicasts for Windows Media Player only. You can broadcast to any number of players, and direct client statistics to a Web server. Unlike with back-channel multicasts, you cannot make all Windows Media unicasts simultaneously available as multicasts.

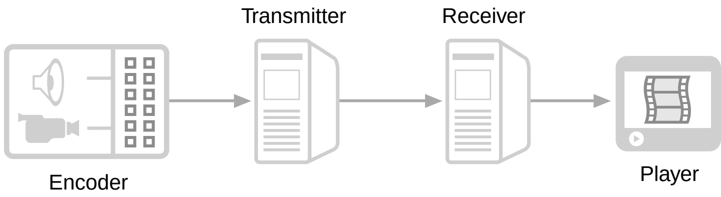
Splitting

Whereas unicasting and multicasting deliver broadcast streams to media players, splitting transmits a broadcast stream in any media format from one Helix Universal Server to another. As explained in Chapter 9, a Helix Universal Server acting as a *transmitter* delivers a live media stream to other Helix Universal Servers acting as *receivers*. Each receiver then broadcasts the stream to media players, either through unicasting or multicasting.

Splitting is a powerful feature that provides many ways to deliver a broadcast to any number of Helix Universal Servers connected on an intranet or through

the Internet. By increasing the pool of Helix Universal Servers broadcasting an event, you can unicast to many thousands of viewers on the Internet, or multicast behind the firewalls of different facilities your organization maintains around the world.

Splitting



Archiving

Live events don't exist as files, but you can use the archiving feature to write live content to a file as you broadcast. You can then stream the archive on-demand if you wish. Archiving a broadcast on Helix Universal Server works only with RealMedia and MP3 broadcasts. For more information, see "Archiving Broadcasts" on page 117.

Redundant Encoders

For important live broadcasts, Helix Universal Server can use multiple encoding sources. Should one source become unavailable, Helix Universal Server switches automatically to the next source. Encoder redundancy works with any media format, is easy to set up, and has a few global parameters that the section "Using Broadcast Redundancy" on page 122 explains.

Simulated Live Broadcasting

A broadcast event does not have to be a live stream delivered by a media encoder. Using the SLTA utility, which Chapter 10 covers, you can simulate a live broadcast using any number of prerecorded audio or video clips. This is a handy way to reach viewers in different time zones, for instance, or to stream encore presentations of live events. You might also broadcast clips that were never broadcast live. You can set up a playlist of songs, for example, and use SLTA to stream an Internet radio program. To the viewer, a simulated live broadcast appears to be a live event.

Feature Comparison

The Helix Universal Server features described in the preceding sections work for all audio and video content, including RealMedia and MPEG, streamed to RealOne Player. Not all features are available when you stream other media formats to other media players, however. The next table summarizes the Helix Universal Server features available when you stream the following formats to the following media players:

- Windows Media (`.asf`, `.wma`, `.wmv`) to Windows Media Player
- QuickTime (`.mov`) or MPEG-4 (`.mp4`) to Apple QuickTime Player
- standards-based RTP-based formats, such as MPEG-4 (`.mp4`), to an RTP-based player

Helix Universal Server Feature Comparison for Various Media Players

Helix Universal Server Feature	Windows Media	Apple QuickTime	RTP-Based	Reference
HTTP cloaking for firewalls	**yes**	no	no	page 60
Launch utility for Web page links	**yes**	no	no	page 78
Aliases in URLs	**yes**	**yes**	**yes**	page 84
Viewable clip source information	no	no	no	page 88
Reconnection to a redundant server	no	no	no	page 93
Cached content	**yes**	**yes**	**yes**	page 96
Proxied on-demand and live streams	**yes**	**yes**	**yes**	page 105
Unicasting	**yes**	**yes**	**yes**	page 115
Redundant live stream encoders	**yes**	**yes**	**yes**	page 122
Back-channel multicasting	no	no	no	page 146
Scalable multicasting	**yes**	**yes**	**yes**	page 149 page 156
Splitting from transmitter to receiver	**yes**	**yes**	**yes**	page 161
Simulated live broadcasts	**yes**	**yes**	**yes**	page 193
Access control by IP address	**yes**	**yes**	**yes**	page 243
User name and password validation	no	**yes**	no	page 249
Media player ID validation	no	no	no	page 276
SMIL-based ad insertion	no	no	no	page 301
Access request logging	**yes**	**yes**	**yes**	page 329

(Table Page 1 of 2)

Helix Universal Server Feature Comparison for Various Media Players (continued)

Helix Universal Server Feature	Windows Media	Apple QuickTime	RTP-Based	Reference
Custom logging reports	**yes**	**yes**	**yes**	page 357
Online activity monitoring	**yes**	**yes**	**yes**	page 371

(Table Page 2 of 2)

Helix Universal Server Components

Helix Universal Server runs on several server operating systems, including Windows and many UNIX variants. Although a few of its features are specific to Windows or UNIX, Helix Universal Servers on all operating systems are virtually identical in their setup and operation. The following sections describe the major components of Helix Universal Server.

Plug-ins

Plug-ins provide the functionality of Helix Universal Server's individual features, and reside in a `Plugins` subdirectory of your Helix Universal Server installation directory. Helix Universal Server uses one plug-in to stream RealVideo, for instance, and another to stream QuickTime. Plug-ins also provide server features such as user authentication. Using Helix Universal Server's open architecture, third parties can create additional plug-ins, enabling you to extend Helix Universal Server's capabilities.

Helix Administrator

Helix Administrator is a secure, HTML-based interface that lets you run Helix Universal Server through a frames-capable and Java-enabled browser located anywhere on your network. Helix Administrator divides Helix Universal Server features into functional areas, and supplies easy-to-use forms and screens that allow you to configure Helix Universal Server features, as well as monitor activity. See "Using Helix Administrator" on page 46 for details.

Configuration File

A human-readable, XML-based text file named `rmserver.cfg` stores Helix Universal Server's configuration information. When you change Helix Universal Server's configuration through Helix Administrator, this file is updated automatically. You can also edit the file manually, and maintain

different files for different configurations, selecting the appropriate file when you start Helix Universal Server. Because all configuration information is stored in this single file, you can create a master file that you propagate across multiple Helix Universal Servers to set up an entire network quickly. Appendix A explains the configuration file syntax.

License File

You need one or more license files, which Helix Universal Server reads at start-up, to enable your Helix Universal Server features. RealNetworks distributes license files by e-mail. If you have a network of Helix Universal Servers, you can distribute licenses to create a pool of client connections available to all Helix Universal Servers. For more information, see "Distributing Server Licenses" on page 67.

Working with Other Professionals

Delivering streaming media clips or broadcasts typically requires the effort of several people. As the Helix Universal Server administrator, you'll need to interact with content creators, as well as other network administrators. This guide points out cases where you need to provide Helix Universal Server information to other professionals. The following sections summarize some important aspects of working with others to deliver streaming media presentations.

Encoding Professionals

The people who encode media, whether live broadcasts or on-demand content, need to know the address of Helix Universal Server, protocols, port numbers, and mount points to use in links, especially if you've changed the settings from the defaults. *RealNetworks Production Guide*, which is written for content creators, explains the formats for linking to on-demand clips. However, you'll need to give content creators the URLs to broadcasts, which vary depending on the broadcast features you use.

Helix Universal Server Administrators

If you have multiple servers in different facilities, you'll need to communicate certain information with other Helix Universal Server administrators. When you use splitting, for instance, a Helix Universal Server transmitter in one

facility needs address and other information about a Helix Universal Server receiver in another facility, and vice versa.

Firewall Administrators

If there are users within your network who either cannot receive presentations from Helix Universal Servers on the Internet, or who receive poor-quality streams, the information in Chapter 11 will help the firewall administrator understand what changes can be made to enhance the viewing experience.

PART

II

GETTING STARTED

In this section, you learn how to install and start Helix Universal Server, use the Helix Administrator interface, and set the basic Helix Universal Server configuration.

CHAPTER

3

INSTALLATION AND QUICK START

This chapter explains how to install Helix Universal Server on Windows and UNIX platforms. It also introduces you to Helix Administrator, the Web-based tool for configuring Helix Universal Server. As soon as you start Helix Universal Server, it is ready to stream media, and the last section walks you through the processes for streaming clips and broadcasting live input.

Understanding Installation Issues

Before you install Helix Universal Server, you need to make basic set-up and deployment decisions, as described in the following sections.

Firewalls and Helix Universal Server

You need to choose where to place Helix Universal Server in relation to firewalls—either your firewall or an outside organization's firewall—for optimal communication. Chapter 11 explains general issues involving firewalls. If your organization has a firewall, and you are not sure of its impact on Helix Universal Server communication, be sure to read "Placing Helix Universal Server in a Network" on page 231.

> **Tip:** If you have questions about which ports are available on your network to allow traffic through a firewall, consult with your firewall administrator.

Web Servers and Helix Universal Server

RealNetworks suggests that you do not install Helix Universal Server on the same physical machine that runs your Web server. This eliminates conflicts over ports, and helps to balance loads so that Helix Universal Server is not affected by heavy Web server use, and vice versa. If you need to install Helix

Universal Server on the same computer as your Web server, observe the following precautions.

HTTP Port Resolution

Although HTTP is not a streaming protocol, Helix Universal Server supports HTTP, primarily to handle media requests made by Web browsers, as well as to operate with the HTML-based Helix Administrator. Web browsers and media players typically make HTTP requests on port 80, and if a Web server and Helix Universal Server reside on the same computer, they cannot both use port 80. There are two ways to avoid this port conflict.

Use a Nonstandard HTTP Port for Helix Universal Server

During installation, you can specify a different HTTP port for Helix Universal Server. In this case, though, all HTTP URLs to Helix Universal Server must specify the port number so that clients make the request on the correct port. This creates potential for errors in writing URLs, and may limit client access if firewalls restrict HTTP requests to port 80.

> **For More Information:** See "Handling Communication through Nonstandard Ports" on page 61 and "Streaming to Client Software Behind Firewalls" on page 234.

Bind Helix Universal Server to a Different IP Address

The second, better approach is to use two IP addresses for the same computer, one for Helix Universal Server, the other for the Web server. This requires a *multi-homed* machine that has two or more network interfaces. In this configuration, you assign an IP address to each network interface, then bind Helix Universal Server to one of the IP addresses. In this way, Helix Universal Server and your Web server both use port 80 on different network addresses.

Note, though, that Helix Universal Server may fail to start after installation because of an HTTP port conflict if all of the following conditions are true:

- You install Helix Universal Server on a multihomed machine that also runs your Web server.
- Your Web server uses the IP address assigned to network interface 0.
- Your Web server uses port 80 for HTTP communications.
- You choose port 80 for Helix Universal Server HTTP communications.

The conflict arises because Helix Universal Server binds to network interface 0 after installation. If the Web server is using this address, the two servers will

both try to claim port 80. (No problem arises, though, if the Web server uses a network interface other than 0.) The following procedure explains how to work around this problem.

➤ **To prevent an HTTP port 80 conflict on a multihomed machine:**

1. When installing Helix Universal Server, choose any unused port other than 80 for HTTP.
2. After installation, start Helix Universal Server and bind it to a different IP address on your multihomed machine, as described in "Binding to an IP Address" on page 62.
3. Change Helix Universal Server's HTTP port to 80 as described in "Defining Communications Ports" on page 59.
4. Restart Helix Universal Server.

Web Server MIME Types

Helix Universal Server works with any Web server that supports configurable MIME types. The following table lists the recommended MIME types. Helix Universal Server requires only that the Web server use the MIME types given below for the `.ram` and `.rpm` extensions. See your Web server documentation for information about defining MIME types.

Web Server MIME Types and Extensions

MIME Types	Extensions
`audio/x-pn-realaudio`	`ra, rm, ram`
`audio/x-pn-realaudio-plugin`	`rpm`
`application/x-pn-realmedia`	`rp`
`application/smil`	`smi, smil`
`application/sdp`	`sdp`
`image/gif`	`gif`
`image/jpg`	`jpg, jpeg`
`text/html`	`html, htm`

For More Information: Helix Universal Server can also deliver files over HTTP. For information about configuring its MIME types, see "Adding MIME Types for HTTP Communication" on page 66.

Installing Helix Universal Server

To install Helix Universal Server, you need a binary installation file and a license file, which enables Helix Universal Server features. Although you can install Helix Universal Server without the license file, Helix Universal Server will not operate until you have obtained a valid license file. License files are delivered by e-mail after you download or purchase Helix Universal Server. To install Helix Universal Server as a Windows NT Service, you must have administrative access.

➤ To install Helix Universal Server:

1. Launch the binary setup file you downloaded. If you have a Helix Universal Server installation CD, open the folder named for the operating system you are using, and double-click the setup file.
2. Read the installation recommendations and press **Enter**.
3. Enter the path to the license file you received from RealNetworks, and press **Enter**. The installation process copies the license file to the `License` subdirectory under the main Helix Universal Server directory. On startup, Helix Universal Server reads that copy of the license.
4. Read the end-user license agreement, signifying your agreement to its terms by pressing **Enter**.
5. Enter a path where you want to install Helix Universal Server, or accept the default path on Windows. Examples in this guide assume that you've chosen the default path.

   Note: On Windows, the default installation path for Helix Universal Server differs from previous versions of RealSystem Server. For more information, see "Upgrading in a Different Directory" on page 39.

6. Enter a user name and password, and then confirm your password by entering it again. Your user name and password are required to access various Helix Universal Server features, such as Helix Administrator. Choose a password that is difficult to guess, and that includes both letters and numbers. The password is case-sensitive.
7. In the next set of screens, you define ports that Helix Universal Server uses for the PNA, RTSP, HTTP, and MMS protocols, as well as the port used by Helix Administrator. RealNetworks recommends accepting the default

ports, unless those port values will cause conflicts with other applications. Note the following:

- You can change the port settings later, as described in "Defining Communications Ports" on page 59.
- If you use a nonstandard port for a streaming protocol, you will need to include the port number in URLs, as described in "Handling Communication through Nonstandard Ports" on page 61. For more information about streaming protocols, see "Application-Layer Protocols" on page 228.
- You do not need to configure transport-layer protocols such as TCP and UDP. Helix Universal Server and the client automatically select the transport protocol. After installation, you can restrict the UDP port range, as described in "Changing Port Assignments" on page 60. For background on TCP and UDP, see "Transport-Layer Protocols" on page 226.
- You need the Admin port number to connect to Helix Administrator from a Web browser. As a security feature, the installer generates this port number randomly. RealNetworks recommends that you accept the default, but you may change the value if you wish, or you know that the value will conflict with another port assignment. In either case, remember the port number, or record it in a secure location.
- On UNIX, the default value for the RTSP port is lower than 1024, meaning that you have to log in as `root` to start Helix Universal Server if you accept the default value.

8. On Windows, the default installation sets up Helix Universal Server as a service. This is recommended, but you can prevent this by unchecking the **Run as NT Service** box. If you choose, you can later set up Helix Universal Server to run as a service, as described in "Configuring Helix Universal Server as a Windows Service" on page 45.
9. In the final confirmation screen, review and accept the installation information to complete the installation process.

Upgrading in a Different Directory

If you are upgrading, and you install Helix Universal Server in a path that differs from that of your previous RealSystem Server, move your existing content from the previous installation directory to the new directory after the

installation. You'll need to do this, for example, if you chose the default installation path on Windows:

```
C:\Program Files\Real\Helix Server
```

Content you need to move includes files in the `Content` and `Secure` directories, and, optionally, the `Logs` directory. If you are using authentication, you'll also need to move the files described in Appendix C.

If you plan to use a configuration file from an earlier version of RealSystem Server, you need to edit the configuration information manually to reflect the new installation directory. Look for the variables that give full paths, and change their values accordingly.

> **Warning!** Because editing the configuration file with a text editor can potentially disable Helix Universal Server, be sure to read Appendix A before attempting modifications.

Reinstalling Helix Universal Server in the Same Directory

Reinstallation is generally not necessary, but if needed, you can reinstall Helix Universal Server by repeating the installation procedure described in "Installing Helix Universal Server" on page 38. A reinstallation does not affect media content, but it resets your Helix Universal Server configuration values to their defaults. If you tailored your system configuration after the initial installation, the following tips allow you to retain your data and make your reinstallation process smoother:

- Back up the configuration file (`rmserver.cfg`) to preserve the configuration information. After the reinstallation, replace the file created by the installer with your backup.
- Back up the `slta.cfg` file if you used that file for running SLTA. For more information on SLTA, see Chapter 10.
- Back up any authentication databases (`adm_b_db`, `con_r_db`, and so on) that you've revised or added. This step is necessary only if you've added more users and passwords for authentication than those added during installation. Appendix C explains authentication databases.
- Note the value of the Admin port (**Server Setup>Ports**). If you bookmarked Helix Administrator in your browser, specify the same Admin port during the reinstallation to keep the bookmark functional.

- A reinstallation does not affect cache files, access logs, or error logs. It is therefore not necessary to back up these files before reinstallation. These files reside in the `Cache` and `Logs` subdirectories of the main installation directory.

Running Helix Universal Server

This section describes how to start and stop Helix Universal Server on Windows and UNIX. It lists command line options that you can use when starting Helix Universal Server manually. Additionally, it explains how to configure Helix Universal Server as a Windows service if you did not select that option during installation.

Starting Helix Universal Server

When you start Helix Universal Server manually, you can select which configuration file you want to use. You can also specify command line options on both Windows and UNIX. As described in "Restarting Helix Universal Server" on page 48, you can use Helix Administrator to restart Helix Universal Server following a configuration change.

Starting on Windows

In its default Windows installation, Helix Universal Server is set up as service named "`Helix Server`." In this case, Helix Universal Server always runs in the background, and you do not need to start it. If you did not install Helix Universal Server as a Windows service, you can start it from the **Start** menu or the command line.

Starting Up from the Start Menu

From the **Start** menu, select **Programs>Helix Server>Helix Server**. Helix Universal Server loads the default configuration file, `rmserver.cfg`.

Starting Up from the Command Line

From the **Start** menu, open the command prompt. Navigate to the Helix Universal Server folder, and enter the following command to start Helix Universal Server with its default configuration file. You can use a different configuration file if you wish:

```
Bin\rmserver rmserver.cfg
```

Starting on UNIX

If you performed a default installation of Helix Universal Server, the RTSP port is set lower than 1024, requiring the user who starts Helix Universal Server to log in as `root`. If you do not want Helix Universal Server to inherit `root` privileges, you can switch Helix Universal Server to another user and group name immediately after it starts up. For instructions, refer to "Setting UNIX User and Group Names" on page 63.

You can start Helix Universal Server as an application or as a background process. The following procedure uses the default configuration file (`rmserver.cfg`), but you can specify a different file. If your machine has multiple processors, first see "Setting Processor Count" on page 43.

➤ **To start Helix Universal Server on UNIX:**

1. Start any command shell.
2. Navigate to the main Helix Universal Server installation directory.

   Warning! If you do not start Helix Universal Server from its `Bin` directory, it cannot resolve the relative paths in the configuration file.

3. Choose one of the following options:
   a. Start Helix Universal Server in the background with the following command:
      ```
      Bin/rmserver rmserver.cfg &
      ```
   b. Start Helix Universal Server as an application:
      ```
      Bin/rmserver rmserver.cfg
      ```
   c. Optionally, you can limit the amount of memory that Helix Universal Server uses by including the `-m` parameter, where the number after `-m` specifies the amount of memory in Megabytes (must be greater than 32). The following example starts Helix Universal Server as an application:
      ```
      Bin/rmserver rmserver.cfg -m 512
      ```
      The next example starts Helix Universal Server as a background process:
      ```
      Bin/rmserver rmserver.cfg -m 512 &
      ```

Process ID (PID)

Helix Universal Server creates a text file that records the current value of the process ID of the parent Helix Universal Server process, `rmserver`. The file is stored in the directory indicated by the `PidPath` variable, and is named `rmserver.pid` at installation. If `PidPath` is omitted from the configuration file, Helix Universal Server stores the information in the directory specified by the `LogPath` variable.

Setting Processor Count

On UNIX systems with multiple CPUs, you should set the `ProcessorCount` variable in the configuration file to the number of processors available to Helix Universal Server. If this variable is not configured, or set to the default value of `0`, Helix Universal Server uses its automatic processor test, which may not be accurate if the operating system is busy with other tasks while the test runs. In addition, if you are running Helix Universal Server with a user ID other than `root`, the CPU detection system is not enabled.

> **Tip:** Be sure to back up the configuration file before you edit it. Appendix A explains the configuration file syntax.

➤ **To set the processor count in the configuration file:**

1. Using any text editor, ope the Helix Universal Server configuration file, which resides in the main installation directory and is named `rmserver.cfg` by default.
2. Set the `ProcessorCount` variable to the number of processors on your machine. For example, on a host system with two processors, the setting is:

   ```
   <Var ProcessorCount="2"/>
   ```
3. Save the changes.
4. Start the `rmserver` process with the --sct command. For example:

   ```
   ./rmserver ../rmserver.cfg -m 512 --sct &
   ```

   starts Helix Universal Server with 512 MB of memory while skipping the CPU detection test. See “Starting on UNIX” on page 42 for more startup options.

Using Command Line Options

On both Windows and UNIX, you can include options when starting Helix Universal Server from the command line. In most cases, use these options for

debugging. You list options after the `rmserver` executable name, preceding each option with one or two hyphens as shown here:

```
Bin/rmserver -v rmserver.cfg
```

Command line options have both short names and long names, as summarized in the following table. Additional, Windows-only command line options are described in "Configuring Helix Universal Server as a Windows Service" on page 45.

Command Line Options on Windows and UNIX

Short Name	Long Name	Function
`-v`	`--version`	Print version number and exit.
`-h`	`--help`	Print command line help and exit.
`--out` <*file*>	`--output-file` <*file*>	Redirect console output to file.
`--rss` [*n*]	`--report-server-stats` [*n*]	Report server statistics every *n* seconds. The default is 60 seconds.
`--sct`	`--skip-cpu-test`	Use configuration file CPU setting.

Stopping Helix Universal Server

It's generally not necessary to stop Helix Universal Server when it's running. If you make configuration changes that require a restart, you can restart through Helix Administrator, as described in "Restarting Helix Universal Server" on page 48.

Shutting Down on Windows

If Helix Universal Server was started as a Windows service, stop it through the **Services** control panel. Give the **Start>Settings>Control Panel** command and double-click **Services**. Locate `Helix Server` on the list (your service name may be different), highlight it, and click **Stop**.

If you started Helix Universal Server manually, switch to the command window and press **Ctrl+c**. You can also use the Task Manager (**Ctrl+Alt+Del**) to end the `Helix Server` application.

Shutting Down on UNIX

To stop Helix Universal Server on UNIX, obtain the parent process identification number, and then issue the `kill` command with that process number. The process ID is stored in the `rmserver.pid` file, which is usually kept

in the Logs directory. (The PIDPath variable in the configuration file specifies this location.) You can perform both actions with one command. From the command line, navigate to the directory that contains the Helix Universal Server PID file, and type the following, where *pidfile* is the name of the PID file:

```
kill ‘cat pidfile‘
```

Configuring Helix Universal Server as a Windows Service

If you did not set up Helix Universal Server to run as a Windows service during installation, you can do so at any time by following the procedure below.

➤ To set up Helix Universal Server as a Windows service:

1. Stop Helix Universal Server.
2. From the **Start** menu, open the command prompt and navigate to the Helix Universal Server Bin directory.
3. Import the configuration file you want to use into a specific key in the Windows NT registry by typing the following:

   ```
   rmserver.exe -import[:key] configuration_file
   ```

   using the following values:

key	The Windows NT registry key name you want to use. If you omit it, the default name Config is substituted.
configuration_file	The path and file name of the configuration file to import. The configuration file must use absolute paths for variables such as BasePath. Helix Universal Server does not recognize relative paths while running as a service.

   For example, the following command:

   ```
   rmserver.exe -import:Server1  ..\rmserver.cfg
   ```

   imports all of the values in the rmserver.cfg file into the following key of the Windows registry:

   ```
   HKEY_CLASSES_ROOT\Software\RealNetworks\Helix Server\9.0\Server1
   ```

   Note that you can then start Helix Universal Server using this configuration by typing the following at a command line:

   ```
   rmserver.exe registry:Server1
   ```

4. Install the service by typing the following command at the command prompt:

   `rmserver.exe -install[:ServiceName] "parameters"`

   using the following variables:

ServiceName	The name that will appear in the **Services** dialog box. If you omit *ServiceName*, `Helix Server` is used.
parameters	Either the name of the configuration file, or the Windows registry and key name, as entered in Step 3. The format of the Windows NT registry and key name is `registry:`*key*. Any command line parameters can be used.

   Note: The quotation marks surrounding *parameters* are required. In addition, you must supply the path to the configuration file. Helix Universal Server will not start if it cannot find the configuration file.

   The next time you start Helix Universal Server from the Services dialog, it will use the settings specified in *parameters*, and will be configured to start automatically. For example, the following command:

   `rmserver.exe -install:HelixInternet "registry:Server1"`

   installs Helix Universal Server with the service name **HelixInternet**, and uses the settings in the `Server1` key.

5. Start the service. In the Services control panel, select the name you used for *ServiceName*, and click **Start**.

Removing Helix Universal Server from the Services List

At a command prompt, type the following:

`rmserver.exe -remove[:ServiceName]`

in which *ServiceName* is the optional name of the service. If you omitted a service name when you installed the service, you can omit it here to indicate the default value `Helix Server`.

Using Helix Administrator

Helix Administrator is Helix Universal Server's HTML-based, graphical user interface. It allows you to modify and manage Helix Universal Server from a browser anywhere on your network. The following sections explain how to

start Helix Administrator and use it to manage your Helix Universal Server configuration.

Starting Helix Administrator

To start Helix Administrator, you need to know the port number it uses, as well as the user name and password selected during Helix Universal Server installation. The password is stored in the `MonitorPassword` variable of the configuration file. For background on the configuration file, see Appendix A.

➤ To start Helix Administrator:

1. Start Helix Universal Server if it is not already running.
2. In a Web browser, type the following address:

   `http://`*`address:AdminPort`*`/admin/index.html`

   If your browser is on the same computer as Helix Universal Server, you can typically use the `localhost` address:

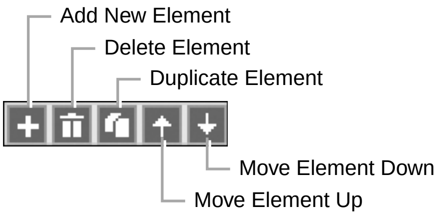
   `http://localhost:`*`AdminPort`*`/admin/index.html`
3. Enter the user name and password chosen during installation. The password is case-sensitive.
4. Click **OK** to start Helix Administrator.

> **Tip:** You can create additional user names and passwords to let other people access Helix Administrator. For more information, see "Administrator Authentication" on page 250.

Using the Interface

Helix Administrator consists of HTML pages that you use to configure Helix Universal Server. The left-hand frame groups features into functional areas, as described in "Helix Administrator Sections" on page 49. Pages that display in the right-hand frame typically consist of forms that include fields and pull-down lists. In pages that list multiple elements, you can use the control icons depicted in the following illustration.

Helix Administrator Controls



When you change configuration information on a Helix Administrator page, click **Apply** at the bottom of the page to save the changes. An arrow appears next to the **Apply** button and the page title tab to indicate that changes require saving. A confirmation dialog appears when you click **Apply**. Note that Helix Administrator discards changes if you navigate to a different page before clicking **Apply**. As well, clicking **Reset** returns the current page to its stored values.

> **Tip:** If you are familiar with earlier versions of RealSystem Server, note that you no longer have to click an **Edit** button to update an element definition. You simply enter the new element information in the appropriate field, and click **Apply** at the bottom of the page to save the change.

Restarting Helix Universal Server

Some configuration changes you make in Helix Administrator require a Helix Universal Server restart, which breaks open connections for live events or clips streamed on demand. It's best, therefore, to make these changes during periods of low use. The Helix Administrator interface indicates feature changes that require a Helix Universal Server restart. It also prompts you when a change requires a server restart when you click **Apply**. Click the **Restart Server** button to restart Helix Universal Server.

Queuing Changes for a Later Restart

It is not necessary to restart Helix Universal Server immediately after you make a configuration change. In this case, the **Pending Changes** flag appears in the upper-right corner of Helix Administrator. This flag reminds you that all pending changes will go into effect the next time Helix Universal Server is started.

Helix Administrator Sections

Helix Administrator's left-hand navigation pane groups Helix Universal Server features under functional areas such as **Broadcasting**. Click the name of a functional area to expand or collapse the list of features it contains. The following tables summarize all features, and point you to the sections of this manual that explain each feature. Features vary according to your operating system and your license agreement, so you may not see all features listed here.

Server Setup

The server setup features let you configure the basic functions of Helix Universal Server. Many of these features are preconfigured at installation.

Server Setup Features

Feature	Function	Reference
Ports	Define ports for communications protocols.	page 59
IP Binding	Select IP addresses Helix Universal Server uses.	page 62
MIME Types	Create additional Web serving MIME types.	page 66
Connection Control	Limit connections by type or bandwidth.	page 64
Redundant Servers	Define failover servers for on-demand content.	page 93
Mount Points	Create mount points for on-demand content.	page 83
URL Aliasing	Shorten long URLs by creating aliases.	page 84
HTTP Delivery	Define Web serving directories.	page 65
Cache Directives	Control proxy caching and splitting.	page 105
Shared Licensing	Set up license publishers and subscribers.	page 67
User/Group Name	Create UNIX user and group name.	page 63
Media Samples	Play sample files.	page 52

Security

The security features let you limit connections to Helix Universal Server, as well as set up user name and password validation for content viewers.

Security Features

Feature	Function	Reference
Access Control	Limit media player connections by IP address.	page 243
User Databases	Select authentication databases.	page 262

(Table Page 1 of 2)

Security Features (continued)

Feature	Function	Reference
Authentication	Create authentication passwords and realms.	page 258 page 264
Commerce	Define commerce rules.	page 267

(Table Page 2 of 2)

Logging and Monitoring

The logging and monitoring features let you view current Helix Universal Server activity, as well as review past, recorded activity.

Logging and Monitoring Features

Feature	Function	Reference
Server Monitor	Display statuses of current connections.	page 371
Access and Error Logging	Compile user and error statistics.	page 329
Custom Logging	Create templates for reports.	page 357
License Monitor	View connections in distributed license pool.	page 69

Broadcasting

Using the broadcasting features, you can unicast live events in any media format.

Broadcasting Features

Feature	Function	Reference
RealNetworks Encoding	Broadcast in the RealMedia format	page 125
QuickTime and RTP Encoding	Broadcast QuickTime or RTP-based media.	page 131
Windows Media Encoding	Broadcast Windows Media.	page 130
Live Archiving	Archive RealMedia broadcasts.	page 117
Broadcast Redundancy	Define backup encoder features.	page 122

Broadcast Distribution

Broadcast distribution builds on the basic broadcasting features, enabling you to multicast live events, as well as distribute broadcast streams to different Helix Universal Servers.

Broadcast Distribution Features

Feature	Function	Reference
Transmitter	Set up a splitting transmitter.	page 180
Receiver	Define a splitting receiver.	page 185
Scalable Multicasting	Multicast to large numbers of RealPlayers.	page 149
Back-Channel Multicasting	Multicast to RealPlayers using a control channel.	page 146
Windows Media Multicasting	Multicast in the Windows Media format.	page 156
Session Announcement	Publicize a multicast automatically.	page 159

Content Management

The content management section groups useful features for managing on-demand clips.

Content Management Features

Feature	Function	Reference
Content Caching	Distribute on-demand content to various servers.	page 96
ISP Hosting	Provide streaming services for ISP customers.	page 285
Content Browsing	List all content stored on your Helix Universal Server.	page 87
View Source	Make source markup and clip information available.	page 88

Advertising

The advertising features appear only if you use Helix Universal Server's Advertising Application.

Advertising Features

Feature	Function	Reference
Ad Serving	Create ad serving mount points.	page 313

(Table Page 1 of 2)

Advertising Features (continued)

Feature	Function	Reference
Ad SMIL Generator	Generate SMIL files with ads automatically.	page 322
Ad Timeouts	Define ad serving timeouts.	page 317

(Table Page 2 of 2)

License File Information

The text-based license file resides in the `License` subdirectory of Helix Universal Server's installation directory. It is in an XML format that you can read with any text editor. Making any changes invalidates the file, however. You can also display the license file through Helix Administrator by clicking **About**. You generally do not need to do anything with the license file, as long as Helix Universal Server reads it correctly on startup.

> **Tip:** If you have multiple license files, Helix Administrator shows the values for all of them at once. In this case, you need to read each file individually and calculate additive features, such as the total number of licensed streams.

> **Note:** If all license files are invalid, Helix Universal Server reports an error message, adds the error to the error log file, and shuts down. To resolve this, contact RealNetworks for a valid license file.

Testing Your Installation

In Helix Administrator, click **Server Setup>Media Samples** to display a page containing links to sample clips. You can quickly test your installation by playing these clips if RealOne Player or another supported media player is installed on your computer. To play RealVideo 9 in RealOne Player, for example, click **Play RealVideo 9 Sample**.

If your Helix Universal Server machine does not include a supported media player, you can play a sample clip from another machine on your network by logging into Helix Administrator from that machine. You can also open a clip directly in a media player. In RealOne Player, for example, give the **File>Open Location** command, then enter a media clip URL such as this:

```
rtsp://helixserver.example.com/real9video.rm
```

> **For More Information:** Chapter 5 explains media clip URLs.

Quick Start Tutorials for Streaming Media

This section gives you step-by-step instructions for performing the basic tasks of streaming a prerecorded clip, and setting up a simple broadcast. These steps will familiarize you with these basic procedures. Keep in mind that there are many options for encoding, streaming, and broadcasting, as described in this guide and *Helix Producer User's Guide*.

Quick Start Requirements

To perform these tasks, you'll need the following software and hardware on a computer other than the one that runs Helix Universal Server:

- RealOne Player
- multimedia equipment:
  - CD player and software
  - sound card
  - speakers
- Helix Producer

  This section provides instructions for using Helix Producer. Although you can use an earlier version of RealProducer, the encoding steps will be different, and you should refer to your user's guide or online help for encoding instructions.
- Web browser
- HTML editor or text editor for creating an HTML page (optional)

> **Note:** Helix Producer and RealOne Player are included with some Helix Universal Server packages. They are also available in free download versions from the RealNetworks Web site at **http://www.realnetworks.com** and **http://www.real.com**.

Creating and Streaming a Clip on Demand

This section explains how to encode and stream a simple music clip. To do this, you'll need a music CD and Helix Producer.

Step 1: Encode a Music Clip

This step encodes a streaming music clip directly from a music CD. Perform this step on the computer that has Helix Producer installed.

➤ **To encode the music clip:**

1. Place a music CD in the computer's CD tray, and play it using the computer's CD player.

   Note: RealJukebox and RealOne Player do not initialize the audio device needed for encoding. If one of these programs launches to play the CD, stop the playback, start the computer's general CD player, and play the CD.

2. Start Helix Producer and give the **File>New Job** command.
3. In the left-hand input section, click the **Devices** radio button, and select the audio device from the **Audio** pull-down list.
4. Choose **File>Add Destination File**, set the file name `ondemand.rm`, and choose a directory for the clip.
5. Click the **Encode button**, wait at least one minute, and click **Stop**.

Step 2: Transfer the Music Clip to the Content Directory

Copy the `ondemand.rm` clip you created in the preceding step to the Helix Universal Server `Content` directory. On Windows NT/2000/XP, the path is:

```
C:\Program Files\Real\Helix Server\Content
```

On UNIX, installation locations may vary, but paths look like this::

```
/usr/local/Real/HelixServer/Content
```

Step 3: Write a Web Page Link (Optional)

Create a link for the clip in an HTML page served by your Web server. Use the following link format, in which you substitute your Helix Universal Server's computer name or IP address for *address*:

```
<a href="http://address:HTTPport/ramgen/ondemand.rm">Click here</a>
```

You do not need to include the HTTP port number if you selected port 80 during the installation. Here is an example:

```
<a href="http://helixserver.example.com/ramgen/ondemand.rm">Click here</a>
```

If your RealOne Player is on the same machine as your Helix Universal Server, you can typically use the local host address:

```
<a href="http://localhost/ramgen/ondemand.rm">Click here</a>
```

> **For More Information:** The `/ramgen/` parameter, which is described in "Launching Media Players and Opening URLs" on page 76, causes the Web browser to start RealOne Player.

Step 4: Play the Clip

If you added the link to a Web page, browse the page and click the link. If you did not create a Web page link, launch RealOne Player, give the **File>Open Location** command, and enter the following URL:

rtsp://*address*:*RTSPPort*/ondemand.rm

You do not need to include the RTSP port number if you selected port 554 during the installation. Here is an example:

```
rtsp://helixserver.example.com/ondemand.rm
```

If your RealOne Player is on the same machine as your Helix Universal Server, you can typically use the local host address:

```
rtsp://localhost/ondemand.rm
```

Broadcasting a Stream

This section explains the basic steps for broadcasting a stream without creating a clip. Perform this step on the computer that has Helix Producer installed.

Step 1: Encode a Music Stream

This step sets up Helix Producer to encode a continuous stream from the music CD, and send the stream to Helix Universal Server.

➤ **To create a live stream:**

1. Place a music CD in the computer's CD tray, and play it using the computer's CD player.

   > **Note:** RealJukebox and RealOne Player do not initialize the audio device needed for encoding. If one of these programs launches to play the CD, stop the playback, start the computer's general CD player, and play the CD.

2. Start Helix Producer and give the **File>New Job** command.
3. In the left-hand input section, click the **Devices** radio button, and select the audio device from the **Audio** pull-down list.
4. Choose **File>Add Destination Server**. In the dialog box, leave the default settings, except for the following:
   a. Enter any destination name, such as **My Helix Universal Server**.
   b. Use the stream name `live.rm`.
   c. For the server address, enter the IP address of the computer on which you installed Helix Universal Server. If your Helix Producer and Helix Universal Server are on the same machine, you can use `127.0.0.1`.
   d. In the **User Name** and **Password** boxes, type the same user name and password you use for logging in to Helix Administrator.
5. If you encoded an on-demand clip as described in the preceding tutorial, select that clip name in the **Destination** box, then click the trash icon to delete it. Your destination server name should be highlighted in the **Destination** box.
6. Click the **Encode button**. After you have verified the broadcast in the following steps, you can turn off the encoding by clicking **Stop**.

Step 2: Write a Web Page Link (Optional)

Create a link for the clip in an HTML page served by your Web server. Use the following link format, in which you substitute your Helix Universal Server's computer name or IP address for *address*:

```
<a href="http://address:HTTPport/ramgen/broadcast/live.rm">Click here</a>
```

You do not need to include the HTTP port number if you selected port 80 during the installation. Here is an example:

```
<a href="http://helixserver.example.com/ramgen/broadcast/live.rm">Click here</a>
```

If your RealOne Player is on the same machine as your Helix Universal Server, you can typically use the local host address:

```
<a href="http://localhost/ramgen/broadcast/live.rm">Click here</a>
```

For More Information: The `/ramgen/` parameter, which is described in "Launching Media Players and Opening URLs" on page 76, causes the Web browser to start RealOne Player.

Step 3: Play the Broadcast

If you created a Web page link, browse the page and click the broadcast link. If you did not create a Web page link, launch RealOne Player, give the **File>Open Location** command, and enter the following URL:

rtsp://*address*:554/broadcast/live.rm

You do not need to include the RTSP port number if you selected port 554 during the installation. Here is an example:

```
rtsp://helixserver.example.com/broadcast/live.rm
```

If your RealOne Player is on the same machine as your Helix Universal Server, you can typically use the local host address:

```
rtsp://localhost/broadcast/live.rm
```

> **Note:** There may be few seconds of delay before playback commences. This slight broadcasting latency helps to ensure reliability.

CHAPTER

4

SERVER SETUP

This chapter describes basic Helix Universal Server setup. These functions include binding to IP addresses, specifying ports, and setting up distributed licenses. You may not need to change any of these settings depending on your system's configuration and the values you chose during installation.

Defining Communications Ports

After you install Helix Universal Server, you can change the ports used for protocols such as RTSP and HTTP, as well as for features such as Helix Administrator. RealNetworks recommends that, whenever possible, you use the default communications ports, which are "well-known" ports that Web browsers and media players use by default when contacting Helix Universal Server. The following table lists the default ports for the protocols that Helix Universal Server uses.

Recommended Port Numbers

Protocol or Feature	Default Port	Purpose
RTSP	554	RTSP-based communication between Helix Universal Server, RealOne Player, and QuickTime Player.
MMS	1755	MMS-based communication between Helix Universal Server and Windows Media Player.
HTTP	80	HTTP-based communication between Helix Universal Server and Web browsers, as well as media players behind firewalls that necessitate HTTP cloaking.
PNA	7070	PNA-based communication between Helix Universal Server and older RealPlayers (primarily RealPlayer 5 and earlier).

(Table Page 1 of 2)

Recommended Port Numbers (continued)

Protocol or Feature	Default Port	Purpose
Admin	(random)	Communication with Helix Administrator. The value is randomly generated during installation, and is required in the browser URL when connecting to Helix Administrator.
Monitor	9090	Communication with the Server Monitor. For more information on this feature, see Chapter 18.

(Table Page 2 of 2)

For More Information: For more information about these protocols, as well as topics such as HTTP cloaking, see Chapter 11.

Changing Port Assignments

You can easily change ports through Helix Administrator. This requires a Helix Universal Server restart, and if you change the Admin port, you'll also need to log into Helix Administrator again with the new port value.

➤ To change Helix Universal Server port settings:

1. Click **Server Setup>Ports**.
2. Change values by entering new numbers for various ports. You can also change global options, described below, that affect how media players use Helix Universal Server ports.
3. Click **Apply**. If you receive an error message that the port is used for UDP communications, choose another port, or restrict the UDP range as described below.

Enable Ramgen Port Hinting URLs

Set to **Yes** by default, this option instructs Helix Universal Server to add protocol port information to all Web page links that use the `/ramgen/` mount point to launch RealOne Player. RealNetworks recommends that you leave this feature set to **Yes**. For additional information, see "Handling Communication through Nonstandard Ports" on page 61.

Enable HTTP Fail Over URL for ASXGen

If you set this option to **Yes**, Helix Universal Server automatically includes an alternate HTTP URL to the streaming content in all Web page links that use

the `/asxgen/` mount point. This allows Windows Media Player to request the content through HTTP if MMS communication is blocked.

UDP Resend Port Range

Initially blank, this option instructs Helix Universal Server to use the specified range of UDP ports for media player replies. Enter a minimum range of two ports for each CPU on the Helix Universal Server machine. "Helix Universal Server Default Ports" on page 237 lists the standard UDP port ranges. For background information, see "Working with Firewall Technologies" on page 231.

Handling Communication through Nonstandard Ports

If you set the port for a communications protocol such as HTTP, RTSP, or MMS to a nonstandard value, media players may not be able to communicate to Helix Universal Server because they won't know which port to use. When you choose the standard ports, which are set up by default during installation, clients always communicate on the correct ports. If you have set nonstandard ports, you can use port hinting, or add port numbers to URLs.

Port Hinting for RealOne Player and RealPlayer 8 through Ramgen

Port hinting tells a media player which communications ports are used for various protocols. This works only for RealPlayer 8 and later. If you keep the **Enable Ramgen Port Hinting URLs** feature at its default value of **Yes**, hinting occurs automatically when you launch RealOne Player or RealPlayer 8 through a Web page link that uses the Ramgen utility.

> **For More Information:** For instructions on using Ramgen, see "Using a Client Launch Utility" on page 78. For background information, see "Streaming to Client Software Behind Firewalls" on page 234.

Port Hinting for RealOne Player and RealPlayer 8 through a Ram File

When using a Ram file to launch a presentation for RealPlayer 8 or later, content creators can include port hints with the `cloakport` parameter. The player then attempts to connect to the server using the specified protocol and ports. This is useful if you have multiple Helix Universal Servers that use different ports. Content creators do not then have to know exactly which port is used on each machine. In the following example, RealPlayer attempts to

connect through RTSP on port 554. If that doesn't work, it tries RTSP on port 550, and so on. You can specify up to four ports:

```
rtsp://helixserver.example.com/video1.rm?cloakport="554 550 1012 9120"
```

Note: You'll need to inform content creators about the `cloakport` parameter, which is not discussed in RealNetworks production guides. For more about the Ram file, see "Using Metafiles" on page 77.

Port Numbers in URLs

You need to include the specific, nonstandard port number in URLs in cases where port hinting and the `cloakport` parameter don't work. This includes communication with Windows Media Player, QuickTime Player, and RealPlayers earlier than version 8. This also applies to Web page links that use the HTTP protocol. For all protocols, you add the port number after the Helix Universal Server address, separating the two with a colon. For example:

```
rtsp://helixserver.example.com:500/video1.rm
```

Note: You'll need to alert content creators to the use of nonstandard ports so that they can write hyperlinks correctly. The section "Writing Links to Content" on page 73 provides more information about Helix Universal Server URLs.

Binding to an IP Address

When Helix Universal Server starts, it uses the IP address assigned to the first network interface it finds on the computer—network interface 0. In a computer with multiple network interfaces—often referred to as a *multi-homed* machine—you can configure Helix Universal Server always to use specific IP addresses. Through this feature, you can select individual IP addresses to use, or you can bind to all the IP addresses on the machine.

Using Localhost

By default, Helix Universal Server binds to the *localhost* address (also called the *loopback* address), which enables a simulated network connection from Helix Universal Server to a client installed on the same computer. When using this address, which is useful for testing, no information is sent over the network, but it appears as if the connection came from the network. You can express this address in dotted decimal form as `127.0.0.1`.

Capturing All Addresses

You can use the IP binding feature to capture all addresses for Helix Universal Server's use. To do this, specify the IP address `0.0.0.0`, and delete all others. Helix Universal Server will automatically bind to all addresses and to localhost. For most installations, RealNetworks recommends binding to all addresses.

Binding to Specific Addresses

If you bind Helix Universal Server to one or more specific addresses, Helix Universal Server binds only to those address, but not to others. In other words, it will not bind to localhost. To bind to a specific address and to localhost, you must add both to the IP binding list.

Modifying IP Addresses

You bind Helix Universal Server to IP addresses using Helix Administrator. You'll need to restart Helix Universal Server after making these changes.

➤ **To reserve IP addresses for Helix Universal Server:**

1. In Helix Administrator, click **Server Setup> IP Binding**.
2. Click the "+" icon and type the IP address that you want Helix Universal Server to use into the **Edit IP Address** box
3. Repeat this procedure for each address on this machine that you want Helix Universal Server to use.

   Warning! Use either `0.0.0.0` or specific addresses, but never both. If you use both, Helix Universal Server will not start.

4. Click **Apply**.

Setting UNIX User and Group Names

By default, Helix Universal Server on UNIX uses the user and group names of the person who starts it. After startup, though, it can immediately switch to a different user and group setting. This lets you start Helix Universal Server as `root`, so that it can capture port 554 for RTSP communications, then assume a different user and group identity. The user and group names must be

predefined through the operating system, and must have write permission for Helix Universal Server's `Logs` and `Secure` directories.

➤ To change the group or user names:

1. In Helix Administrator, click **Server Setup>User/Group Name**.
2. Type the user name or ID number in the **User Name or ID** box. The default is `%-1`, which means Helix Universal Server uses the name of the user who logged in and started Helix Universal Server.
3. Type the user name or ID number in the **Group Name or ID** box. The default is `%-1`, which means that Helix Universal Server uses the group name of the user who logged in and started Helix Universal Server.
4. Click **Apply**.

Controlling Connections

Helix Universal Server lets you limit the number and types of media client connections made. As well, you can set a limit on the bandwidth that Helix Universal Server uses for streaming. All settings are optional.

> **For More Information:** For instructions about requiring a user name and password for client connections, see Chapter 13. See also the access control feature described in Chapter 12.

➤ To limit connections:

1. In Helix Administrator, click **Server Setup>Connection Control**.
2. In the **Maximum Client Connections** box, enter an integer to specify the total number of media players that can connect simultaneously. Once this limit is reached, players attempting to connect receive an error message, and will not be able to connect until other players disconnect.

   You can specify a number from `1` to `32767`. The value must be less than or equal to the number of streams permitted by your license. If the value is `0` or blank, Helix Universal Server uses the number of streams specified by your license.
3. To stream media only to RealNetworks clients, set the **RealPlayers Only** pull-down to `On`. Other media players cannot then connect.
4. To stream media only to RealPlayer Plus and RealOne Player, set the **RealPlayer Plus Only** pull-down to `On`. Other media players, as well as any

free versions of RealPlayer that predate RealOne Player, cannot then connect.

5. For **Maximum Bandwidth**, you can enter a number in Kilobits per second (Kbps). Helix Universal Server refuses additional media player connections once this bandwidth limit is exceeded.

   Tip: Your Helix Universal Server license may allow more bandwidth than is suitable for your network. Check with your network administrator to determine the right number to use.

6. Click **Apply**.

Configuring HTTP Communications

Although not intended to be used as a Web server, Helix Universal Server can serve any content over HTTP. The following sections cover configuration options for extending HTTP delivery to specific content paths, and for defining MIME types. You generally do not need to change these settings unless you intend to use Helix Universal Server for Web serving functions.

Allowing HTTP Delivery

By default, Helix Universal Server restricts HTTP delivery to defined directories. This protects streaming media content from HTTP downloading, which may place copies of downloaded clips in Web browser caches. To serve content in a new location over HTTP, you specify which mount points allow HTTP requests. The following mount points (and the subdirectories of their base paths) are preconfigured to allow HTTP delivery.

Mount Points that Allow HTTP Requests

Mount Point	Function
`/admin`	Delivering Helix Administrator pages. See “Starting Helix Administrator” on page 47.
`/ramgen`	Taking RealMedia requests from browsers. See “Using a Client Launch Utility” on page 78.
`/httpfs`	Delivering any media or HTML page through HTTP.
`/viewsource`	Sending HTML pages that list source information and markup. See “Displaying Source Information” on page 88.

(Table Page 1 of 2)

Mount Points that Allow HTTP Requests (continued)

Mount Point	Function
`/encfs`	Negotiating port settings between Helix Universal Server and Helix Producer.
`/asxgen`	Taking Windows Media requests from browsers. See "Using a Client Launch Utility" on page 78.
`/nscfile`	Launching Windows Media multicasts. See "Defining a Multicast Channel" on page 156.
`/scalable`	Taking scalable multicast requests from browsers. This is added automatically when you set up multicasting. See "Linking to a Scalable Multicast" on page 155.

(Table Page 2 of 2)

Note: You generally do not need to change the settings of the preconfigured mount points. For general information about mount points, see "Mount Points" on page 74.

➤ **To allow HTTP delivery for a mount point:**

1. Define the mount point as described in "Adding a Mount Point for On-Demand Clips" on page 83. Subdirectories beneath the mount point's base path must not contain secure material. If they do, users will not be prompted for their name and password.
2. Click **Server Setup> HTTP Delivery**.
3. Click the "+" icon to add a new path.
4. Change the name in the **Edit Path** box to that of the mount point you created. Include only the initial forward slash, as in `/htmlpages`.
5. Click **Apply**.

Adding MIME Types for HTTP Communication

Because Helix Universal Server acts as a Web server for certain features, it has its own MIME types section. You can modify Helix Universal Server's list of

MIME types if you plan to deliver over HTTP a data type not listed in the following table.

Helix Universal Server MIME Types and Extensions

MIME Type	Extension
audio/x-pn-realaudio	ram
image/gif	gif
image/jpg	jpg, jpeg
text/html	html, htm
text/plain	txt
video/quicktime	mov

➤ To add a MIME type for HTTP serving:

1. Click **Server Setup>MIME Types** in Helix Administrator.
2. Click the "+" icon to add a new MIME type.
3. Enter the MIME type in the **Edit MIME Type** box.
4. Enter a file extension, or a list of comma-separated extensions, in the **Extensions** box. Do not precede file extensions with a period.
5. Click **Apply**.

Distributing Server Licenses

Using distributed licensing, multiple Helix Universal Servers can use a single license, sharing a pool of streams that use specific features. Both the authentication and ad streaming features can use this feature, for example. The Helix Universal Servers that share a license are called a *license group*. Clients are not denied service unless the entire pool of connections in the license group is in use.

When you use distributed licensing, you place the main license file on a main Helix Universal Server, called the *publisher*, then configure additional Helix Universal Servers as *subscribers*. The subscribers look to a primary publisher for licensing information. If the primary publisher is not available, or has too few connections available for use, subscribers can use a secondary publisher.

Each Helix Universal Server, whether a publisher or a subscriber, maintains its own configuration file that you can edit independently, either manually or through Helix Administrator. The features available to each subscriber depend

on the features permitted by the shared license, but you can modify each Helix Universal Server's configuration file independently.

> **Note:** Within a given network or organization, you can have multiple groups, but you should not use this feature outside of a network or across a firewall.

Setting Up Publishers

Carry out the procedure below to define each publisher in you license group. You need to know the IP address and Helix Administrator port used on each publisher you set up. Repeat this procedure on each Helix Universal Server that acts as a publisher.

➤ To set up a publisher:

1. In Helix Administrator, click **Server Setup>Ports** and note the value for **Admin Port**.
2. Click **Server Setup> Shared Licensing** and define all license publishers for this group, including the current Helix Universal Server:
   a. In the **License Publishers** section, click the "+" icon and enter the publisher's IP address in the **Edit Publisher IP Address** box.
   b. In the **Admin Port** box, enter the value of the publisher's Admin port.
   c. Repeat this step to define each additional publisher in the license group.
3. List the subscribers that share this Helix Universal Server's license:
   a. In the **License Subscriber** section, click the "+" icon and enter a descriptive name in the **Edit Subscriber** box to distinguish this subscriber from others.
   b. In the **Subscriber Address** box, type the subscriber's IP address. To indicate a range of addresses, select a bit mask from the **Subscriber Netmask** list. For more information about bit masks, see Appendix B.
   c. Repeat this step for each subscriber not covered by another subscriber definition's netmask.
4. Click **Apply**.

Setting Up Subscribers

Follow the procedure below to set up each subscriber. You'll need to know the values for each publisher's IP address and Helix Administrator port. Carry out this procedure on each Helix Universal Server that acts as a subscriber.

➤ To set up a subscriber:

1. In Helix Administrator, click **Server Setup> Shared Licensing**
2. In the **License Publishers** area, click the "+" icon and type the IP address of the license publisher host in the **Edit Publisher IP Address** box. The subscriber uses the first publisher in the list as its primary publisher, referring to the other publishers in order if the primary publisher is not available, or all of its licensed client connections are in use.
3. In the **Admin Port** box, type the value of the publisher's Admin port.
4. Repeat these steps for each publisher in the license group.
5. Click **Apply**.

Starting and Monitoring a License Group

After you have configured both publishers and subscribers, restart the publishers, then restart the subscribers. This activates distributed licensing, allowing Helix Universal Servers to pool their stream count and feature availability.

On the publisher, you can use a license group monitor to view the number of connections currently used by the subscribers. In the publisher's Helix Administrator, click **Logging & Monitoring> License Monitor**. The License Monitor page appears, showing the number of publishers, subscribers, and connections currently in use.

PART

III

STREAMING CLIPS

In this section, you'll learn how to stream prerecorded clips, and create links to media content. You'll also learn about useful features that you can employ if you have a large network of servers.

CHAPTER 5

CLIP DELIVERY

Helix Universal Server is ready to stream prerecorded clips right after installation. As with any Internet server, you request content from Helix Universal Server using a hypertext URL, which you typically add to a Web page. This chapter explains link formats, introducing you to *mount points*. It shows you how to launch a media player from a Web page, and covers additional features that help you deliver prerecorded clips.

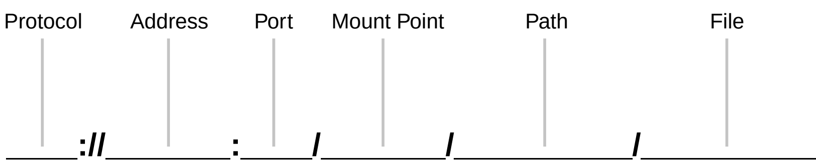
Writing Links to Content

A Web page hyperlink to content on Helix Universal Server launches a media player and streams some content, whether a prerecorded clip or a live broadcast. A typical link to a media clip or a broadcast served by Helix Universal Server includes the server address, protocol port (optional), mount points, path, and file name:

`protocol://`*`address`*`:port/mount_points/`*`path/file`*

The following illustration shows the parts of a typical link. Not every link includes the same components, however.

Parts of a Link



The following table describes common link components.

Helix Universal Server URL Components

Component	Specifies
protocol://	The protocol used to initiate streaming. This is `rtsp://`, `mms://`, `pnm://`, or `http://`. For more information on these protocols, see "Application-Layer Protocols" on page 228.
address	Address of Helix Universal Server, either a dotted IP address or a machine and domain name.
port	Port where Helix Universal Server listens for requests on the specified protocol. This is not required if Helix Universal Server uses the default, well-known ports. For more on ports, see "Defining Communications Ports" on page 59.
mount_points	One or more mount points that invoke Helix Universal Server features. You can stream simple, on-demand clips using just a forward slash after the address and port. For more information, see "Mount Points" on page 74.
path	An optional path relative to the `Content` directory. If the file is in the `Content` directory, no path is required. Broadcast URLs do not include a path. For more information, see "Creating Content Subdirectories" on page 82.
file	The name of the presentation, including the extension. The file can be a clip or a metafile used to launch the clip, as described in "Launching Media Players and Opening URLs" on page 76. Broadcasts also use a file name specified by the encoder, even if no file is created on the computer.

Tip: For examples of the different types of links, as well as the features of SMIL files, view the demonstrations by clicking **Server Setup>Media Samples** in Helix Administrator, and then choosing the SMIL demonstration links.

Mount Points

All URLs to clips or live streams served by Helix Universal Server include at least one mount point that looks like a directory listing in the request URL. If you worked through the section "Creating and Streaming a Clip on Demand" on page 53, you may have written a Web page URL that includes the `/ramgen/` mount point, like the following example:

```
<a href="http://helixserver.example.com/ramgen/video1.rm">Play RealMedia</a>
```

In the preceding URL, the `/ramgen/` mount point does not correspond to a physical path on the Helix Universal Server computer. Instead it's a virtual path that invokes a Helix Universal Server feature. In this case, the mount point tells Helix Universal Server to use its Ramgen feature to send the browser a MIME stream that launches RealOne Player.

> **For More Information:** For more on Ramgen, see "Using a Client Launch Utility" on page 78.

Content Directory Mount Point

Using Ramgen launches RealOne Player and passes it the media URL. The URL that RealOne Player uses, however, does not include the `/ramgen/` mount point, which has already served its purpose. Additionally, the URL is reconfigured to use the RTSP streaming protocol. Hence, RealOne Player receives the following URL for requesting the streaming content:

```
rtsp://helixserver.example.com/video1.rm
```

This URL also contains a mount point, though it's easy to miss because it's simply the slash that precedes the clip name:

```
.../video1.rm
```

This mount point indicates that the clip resides in Helix Universal Server's main content directory. This directory, named `Content`, is located in the Helix Universal Server installation directory. A directory linked to a mount point is known as the mount point's *base path*. In a default installation on Windows, the base path for the "\" mount point is the following:

```
C:\Program Files\Real\Helix Server\Content
```

On UNIX, installation locations may differ, but the content directory falls under the main Helix Universal Server directory:

```
/usr/local/Real/HelixServer/Content
```

The "/" mount point therefore masks the actual path to the streaming media content on the Helix Universal Server computer.

> **For More Information:** "Streaming Clips On Demand" on page 81 contains additional information about paths and mount points for streaming on-demand clips.

Multiple Mount Points

A URL may have several mount points. In the quick start section "Broadcasting a Stream" on page 55, you had the option of creating a Web page URL to play a live broadcast, using two mount points as in the following example. Here, the `/ramgen/` mount point launches RealOne Player, whereas the `/broadcast/` mount point indicates that the content is live rather than prerecorded:

`.../ramgen/broadcast/``live.rm`

When a URL includes `/broadcast/`, Helix Universal Server does not search its content directory for a clip named `live.rm`. Instead, it knows that the URL is to a live stream sent by Helix Producer. The configuration information for the `/broadcast/` mount point gives Helix Universal Server the information it needs to find the content, such as what server port Helix Producer uses to deliver the stream.

Helix Universal Server predefines mount points for many features. You add certain mount points to URLs to insert advertisements in media clips, for example. In some cases, you need to define your own mount points to set up a feature. When a feature requires a mount point, this guide's instructions on implementing that feature explain how to configure the mount point, as well as how to add the mount point to URLs to invoke the feature. In many cases, URLs must list mount points in a specific order for the various features to work.

Launching Media Players and Opening URLs

A clip that streams over the RTSP or MMS protocol must use a URL that starts with `rtsp://` or `mms://` rather than with `http://`. Because browsers cannot make RTSP or MMS requests, you cannot link a Web page directly to a streaming media clip that uses a streaming protocol. You resolve this problem either by adding a metafile, or using a client launch utility on Helix Universal Server.

> **Note:** Most media players also have an **Open** command that lets viewers enter a media URL directly without clicking a link. In this case, the URL is the same as that used in a metafile. Although viewers can play clips this way, this method is not recommended because it is awkward and prone to errors.

Using Metafiles

A metafile is a simple text file that links to a Web page through a standard `<a href>` link that specifies the HTTP protocol. The metafile contains the streaming media URL, and uses a file extension that causes the Web browser to launch a media player as a helper application. The browser then passes the metafile to the media player, which requests the streaming content over a streaming protocol. Each media player uses a different type of metafile.

RealNetworks Ram File

For RealOne Player, metafiles are known as *Ram files* because they use the file extension `.ram`. If the media is embedded in a Web page, though, the file extension is `.rpm`. When the viewer clicks the Web page link to the Ram file, the browser launches RealOne Player and gives it the Ram file, which contains the URL to the streaming clip, such as the following:

```
rtsp://helixserver.example.com/video1.rm
```

RealOne Player can also play SMIL presentations that coordinate multiple clips. In these cases, the SMIL file lists the RTSP URLs to the clips. The Ram file gives the RTSP (or HTTP) URL to the SMIL file.

> **For More Information:** The presentation delivery chapter of *RealNetworks Production Guide* covers the Ram file syntax, and explains how content creators can use the Ram file to pass playback parameters to RealOne Player.

> **Tip:** A Ram file feature called a *cloakport switch* helps you to mitigate the effect of restrictive firewalls on RTSP clients. This switch passes Helix Universal Server port information to the client in case the RTSP connection is blocked by a firewall. See "Handling Communication through Nonstandard Ports" on page 61.

QuickTime Reference Movie

Although Apple's QuickTime Player also receives streaming content over RTSP, it has its own metafile extension and syntax. You use the QuickTime **MakeRefMovie** tool to create a reference movie that contains the RTSP URL or URLs to your QuickTime presentation on Helix Universal Server.

> **For More Information:** See the QuickTime documentation for information on **MakeRefMovie**. You may find the Web page

http://www.apple.com/quicktime/products/tutorials/refmovies.html helpful as well.

Windows Media ASX File

ASX files are the Windows Media equivalent to RealNetworks Ram files. They are plain text files that use the file extension .asx. They list the URLs to Windows Media clips that stream over the MMS protocol. Within the ASX file, the requested content uses an mms:// link that points to Helix Universal Server:

```
mms://helixserver.example.com/video2.wmv
```

For More Information: See your Windows Media documentation for instructions about writing ASX files. The ASX file can also include information to work around restrictive firewalls.

Using a Client Launch Utility

As an alternative to writing a metafile, you can use a client launch utility that allows you to link your Web page directly to a streaming clip. In this case, the Web page URL used to request the streaming clip must include the mount point for the launch utility. This causes Helix Universal Server to launch the appropriate media player, and stream the clip using the player's preferred streaming protocol. Helix Universal Server includes launch utilities for RealOne Player and Windows Media Player. QuickTime has no equivalent utility.

Ramgen for RealOne Player

Helix Universal Server's Ramgen utility is preconfigured with a /ramgen/ mount point that launches RealOne Player. To use the Ramgen utility, you include the /ramgen/ mount point in a Web page URL to a streaming clip, just after the Helix Universal Server address. To enable the browser to make the request, you use the HTTP protocol rather than RTSP:

```
<a href="http://helixserver.example.com/ramgen/video1.rm">Play RealMedia</a>
```

When Helix Universal Server receives a request that contains the /ramgen/ mount point, it sends a MIME stream to the browser that launches RealOne Player. It then streams the clip or SMIL file to RealOne Player using the RTSP protocol. Hence, the preceding Ramgen link is equivalent to linking to a Ram file from a Web page:

```
<a href="http://www.example.com/launch_video.ram">Play RealMedia</a>
```

and having the `launch_video.ram` file request the clip over RTSP:

```
rtsp://helixserver.example.com/video1.rm
```

> **Note:** To circumvent restrictive firewalls, Helix Universal Server adds the cloakport switch when using Ramgen. For more information, see "Handling Communication through Nonstandard Ports" on page 61.

> **For More Information:** Content creators can learn about Ramgen from the presentation delivery chapter of *RealNetworks Production Guide*. Note that Ramgen does not support as many playback parameters as a Ram file, which makes the Ram file a more powerful tool for content creators.

ASXGen for Windows Media Player

ASXGen is the equivalent to Ramgen for launching Windows Media Player. Helix Universal Server comes configured with a mount point named `/asxgen/`, which you add to a Web page link instead of writing an ASX file. When Helix Universal Server receives a request that contains the `/asxgen/` mount point, it sends a MIME stream that causes the browser to launch Windows Media Player.

To stream to Windows Media Player 6.4, add the `.asx` extension to an ASXGen link for an `.asf`, `.wmv`, or `.wma` clip. The extra `.asx` extension is not necessary if you are streaming exclusively to Windows Media Player 7 and later, however. In the following example, the URL is for `video2.wmv.asx`, even though the clip on Helix Universal Server is `video2.wmv`. When it receives the request, Helix Universal Server strips off the extra `.asx` extension:

```
<a href="http://helixserver.example.com/asxgen/video2.wmv.asx">Play Windows Media</a>
```

Once Windows Media Player launches, Helix Universal Server streams the requested content using the MMS protocol. To circumvent restrictive firewalls, Helix Universal Server can also transmit an HTTP URL that duplicates the MMS link, enabling HTTP cloaking for Windows Media Players behind restrictive firewalls.

> **For More Information:** For information on enabling HTTP cloaking for Windows Media Player, see "Changing Port Assignments" on page 60.

Tips for Launching Media Players

Keep the following points in mind when linking Web page to streaming media clips.

Do Not Use Both Metafiles and Launch Utilities

Metafiles and the Ramgen and ASXGen utilities are mutually exclusive. If you launch content with a Ram file, for example, make sure that the requested URL does **not** contain the `/ramgen/` parameter.

Incorrect URL in a Ram File

rtsp://helixserver.example.com**/ramgen/**video1.rm

Correct URL in a Ram File

rtsp://helixserver.example.com/video1.rm

Conversely, when using Ramgen or ASXGen, make sure that your Web page link points to a streaming clip, not to a Ram file.

Incorrect File Request in a Web Page URL Using Ramgen

Play RealMedia

Correct File Request in a Web Page URL Using Ramgen

Play RealMedia

Use the Correct Protocol

Remember that media clips and broadcasts stream over RTSP or MMS, but Web browsers can make requests only over HTTP. Specifying an incorrect protocol can prevent a presentation for launching, or degrade its playback. When using metafiles, ensure that URLs use streaming protocols.

Incorrect Protocol in a Ram File

http://helixserver.example.com/video1.rm

Correct Protocol in a Ram File

rtsp://helixserver.example.com/video1.rm

When using Ramgen or ASXGen, make sure that your Web page link uses HTTP, rather than a streaming protocol such as RTSP or MMS.

Incorrect Protocol in a Web Page URL Using Ramgen

Play the Video

Correct Protocol in a Web Page URL Using Ramgen

Play the Video

Use Streaming Media URLs in SMIL Files

Content creators may create SMIL presentations for RealOne Player. In this case, you treat the SMIL file as if it were a streaming media clip. That is, you link to the SMIL file from a Ram file:

```
rtsp://helixserver.example.com/presentation.smil
```

or in a Web page link that uses Ramgen:

```
<a href="http://helixserver.example.com/ramgen/presentation.smil">...</a>
```

The SMIL file itself then contains URLs to the various clips. These are typically RTSP URLs such as those you write in a Ram file:

```
<video src="rtsp://helixserver.example.com/video1.rm" region="video_region".../>
```

For More Information: *RealNetworks Production Guide's* clip source tags chapter explains SMIL URLs.

Communicate with Content Creators

You will need to give some information to content creators so that they can transfer their content to Helix Universal Server and write valid hyperlinks. The main reference manual for content creation, *RealNetworks Production Guide*, explains protocols, Ram files, and the Ramgen utility. However, content creators must rely on the Helix Universal Server administrator for the following information:

- Helix Universal Server address
- whether the port must be specified along with the protocol
- mount points (other than `/ramgen/`) to use to implement specific Helix Universal Server features
- method for transferring content to Helix Universal Server, such as file copy or FTP
- paths to the streaming content when it is transferred to Helix Universal Server

Streaming Clips On Demand

Helix Universal Server is ready to stream clips as soon as it starts up. As the quick start section "Creating and Streaming a Clip on Demand" on page 53 demonstrated, all you do is place a clip in the `Content` directory and write a link as described in "Writing Links to Content" on page 73. The following

sections provide information about additional, optional ways to configure Helix Universal Server to stream clips on demand.

Creating Content Subdirectories

On your Helix Universal Server computer, you can create subdirectories under the predefined `Content` directory, which is described in "Content Directory Mount Point" on page 75. On Windows, for example, you might create a `video` subdirectory in the `Content` directory. In a default Helix Universal Server installation on Windows, the full path would be the following:

```
C:\Program Files\Real\Helix Server\Content\video
```

In an installation on UNIX, it may look like this:

```
/usr/local/Real/HelixServer/Content/video
```

A Ram file link to a video clip in this subdirectory would include the `video` subdirectory, but not the path to the main `Content` directory:

```
rtsp://helixserver.example.com/video/video1.rm
```

If, for example, the link occurred in a Web page and used Ramgen, the `video` subdirectory listing would follow the `/ramgen/` mount point (and any other mount points) in the URL

```
<a href="http://helixserver.example.com/ramgen/video/video1.rm">Play</a>
```

Tips for Using Content Subdirectories

- Just by examining a link, you can't determine which parts of a link refer to mount points, and which parts refer to subdirectories. You must be familiar with the mount points set up on Helix Universal Server to recognize the mount points in use.
- Helix Universal Server looks through the list of mount points before it looks for directory names. Should a mount point have the same name as an actual directory, Helix Universal Server will use the mount point and ignore the actual directory.
- You can create aliases for long subdirectory listings, as described in "Setting Up Aliases" on page 84.
- When broadcasting live events, you can take advantage of mount points and directories that have the same names to display a standby message if the broadcast has not begun, or is interrupted. See "Playing a Standby Message" on page 137.

Adding a Mount Point for On-Demand Clips

If possible, place all of your streaming clips in the `Content` directory or its subdirectories. If necessary, though, you can stream content from other directories, disks, or networked machines. Instead of using symbolic links or aliases from the `Content` directory to other directories, however, you create new mount points for on-demand clips. Each mount point specifies a base path where Helix Universal Server locates the files. You then use the new mount point in URLs for on-demand clips located in the new directory.

➤ To create a new on-demand mount point:

1. In Helix Administrator, click **Server Setup>Mount Points**.
2. Click the "+" icon to add a new mount point.

   Tip: You can also edit an existing mount point by selecting it from the list, changing the information, and clicking **Apply**. You can change the base path of the `Content` directory, for example, by editing the `RealSystem Content` mount point definition.

3. Enter a new, unique name to replace the generic mount point name that appears in the **Edit Description** box.
4. Specify the mount point as it will appear in the request URL in the **Mount Point** box. Do not use spaces in the name, and enclose the name with forward slashes, as in `/video_clips/`.
5. In the **Base Path** box, enter the full path to the directory that stores the content.
6. If content resides in an external data store such as a Network File System (NFS) or a storage area network (SAN), you may see a performance increase by selecting **Network** from the **Base Path Location** box.
7. Change **Cacheable by Caching Subscribers** to `No` if you are using this server as a content-caching subscriber, and you do not want this subscriber to search content publishers for this mount point. For more on this feature, see "Content Caching" on page 96.
8. Click **Apply**.
9. If you intend to serve content under this mount point through HTTP URLs, set up HTTP delivery as described in "Allowing HTTP Delivery" on page 65. This is generally not recommended for streaming clips, though,

because HTTP delivery caches content in browsers, and allows viewers to save clips to disk.

> **Note:** Even if you do not allow direct HTTP requests for the content, Helix Universal Server can deliver the content to media players over HTTP as necessary to work around firewall restrictions. Media players do not cache the content, though.

Using On-Demand Streaming with Other Features

This following table describes the ways in which on-demand streaming works with other features.

On-Demand Streaming Used with Other Features

Feature	Interaction with On-Demand Streaming
Simulated Live Broadcasting	You can use the Simulated Live tool (SLTA) to broadcast on-demand files as if they were live. See Chapter 10.
Live Archiving	If you have used the live archiving feature to convert live streams to on-demand files, you can then create links to these files and deliver them on demand. You can also use the archived files to recreate a live presentation using SLTA.
Helix Universal Proxy	Helix Universal Server is configured to allow Helix Universal Proxy to cache on-demand content streamed by Helix Universal Server. To prevent certain on-demand clips from being cached, see "Preventing Streams from Being Cached or Split" on page 109.
Access Control, Authentication	Any access control or authentication rules you set up for Helix Universal Server are automatically used when users request on-demand content with RealOne Player. QuickTime Player support is limited to basic user name/password authentication.
Monitoring	You can view which presentations are streaming at any time with the Server Monitor. Click the **Connections** tab or the **Files** tab to see which files are in use.
Logging	All presentations streamed from Helix Universal Server, whether on-demand or live, are recorded in the access log. QuickTime and Windows Media Player connections are included.

Setting Up Aliases

Aliases are substitutions for actual file names and directory paths used in URLs. With an alias, you can mask resources or simplify published URLs for

any links that use any protocol. Suppose that the following example is a path to a file located on the physical disk of a Helix Universal Server:

```
C:\Program Files\Real\Helix Server\Content\music\pop\video1.rm
```

In this sample, `video1.rm` resides a few subdirectories below the `Content` directory. The following might be the unaliased URL for this file:

```
rtsp://helixserver.example.com/music/pop/video1.rm
```

Using aliasing, you can assign the content `music/pop/video1.rm` to any value, such as the following:

Content:	`music/pop/video1.rm`
Alias:	`example.rm`

Helix Universal Server would then play the `video1.rm` clip when a viewer requested the following URL:

```
rtsp://helixserver.example.com/example.rm
```

Helix Universal Server replaces only the alias portion of the URL. If you enter characters in the URL before or after the alias, that part of the URL remains unchanged. For example, consider the following changes in the preceding resource-to-alias value pair:

Content:	`music/pop/`
Alias:	`example`

For Helix Universal Server to play `video1.rm`, you would use the following URL:

```
rtsp://helixserver.example.com/example/video1.rm
```

Here, Helix Universal Server replaces the alias with the exact characters in the resource, leaving the file name intact. If the preceding URL did not contain the file name, the resolved alias would lead to a subdirectory, not a clip.

Preventing Alias Blind Spots

You need to be careful to avoid content blind spots—or content that cannot be accessed by a URL—by using aliases that match resources. Suppose that you had two files named `video.rm` and `audio.rm` in Helix Universal Server's `Content` directory, and you created the following alias/resource pair:

Content:	`audio.rm`
Alias:	`video.rm`

The following URL would always play the `audio.rm` file:

`rtsp://helixserver.example.com/video.rm`

You would not be able to form a URL to play `video.rm` because Helix Universal Server would always translate the characters `video.rm` into `audio.rm`. The only way to write a URL to play the actual `video.rm` clip would be to create an alias that uses the `video.rm` clip as its resource.

Tips for Defining Aliases

Observe the following considerations and limitations when setting up aliases:

- Aliases are for use only in URLs. Do not use an alias within a field in a Helix Administrator page. If you need to specify a mount point to enable a Helix Universal Server feature, for example, use the actual mount point, not an alias.
- You can use an alias in an HTTP URL to media content that uses the `/ramgen/` or `/asxgen/` mount point. However, aliases do not function in HTTP URLs used by browsers to request Web pages.
- Do not use more than one alias in a URL.
- Do not create an alias that contains only numbers. You can use one or more numbers within an alias that also contains letters, however.
- Slashes in aliases have no special meaning. Hence, neither a forward slash nor a backslash indicate any type of directory structure.
- When it searches for an alias-to-resource match, Helix Universal Server parses requests from left to right.
- Helix Universal Server always selects the most complete alias match. In other words, Helix Universal Server evaluates its entire list of aliases before selecting a match.

Creating an Alias

Creating an alias is a simple process that the following procedure describes.

➤ To map an alias to a resource

1. In Helix Administrator, click **Server Setup>URL Aliasing**.
2. Click the "+" icon to add a new alias.
3. Enter any descriptive text in the **Alias Description** box.

4. In the **Alias** box, enter the alias you want to map to a resource.
5. In the **Resource** box, enter the portion of the URL to which the alias corresponds.

Using Aliases with Other Features

The following table summarizes the Helix Universal Server features affected by aliasing.

Aliasing Used with Other Features

Helix Universal Server Feature	Interaction with Aliasing
Broadcast Redundancy	Not supported. URLs for broadcast redundancy must use actual resource names, not aliases.
Logging	The `rmaccess` log records actual resource names, not aliases.
Ram files	You can use aliases in Ram files.
Ramgen and ASXGen	You cannot combine the `/ramgen/` or `/asxgen/` mount point with an alias.
HTTP Protocol	Helix Universal Server does not support aliased HTTP URLs. Aliases work only with RTSP, PNA, and MMS protocols.
Splitting: transmitters	Aliases are not supported. Transmitters always cite the actual name of the live source.
Splitting: receiver	You can use aliases in URLs
Multicast: backchannel	You can use aliases in URLs.
Helix Administrator	Aliases not supported.
Unicasting/On-demand streaming	You can use aliases in URLs.
Windows Media delivery	An alias is required for pull splitting Windows Media content. Push splitting does not require an alias.

Browsing On-Demand Content

Helix Administrator's content browsing feature allows you to list all on-demand clips residing on Helix Universal Server. You specify the mount points and types of clips, such as all clips or only the RealVideo clips, that you want

to see. Helix Administrator then generates an HTML page listing and linking to all clips that fit those criteria.

➤ To create a content browsing list:

1. Click **Content Management>Content Browsing** in Helix Administrator.
2. The **Browsable Mount Points** box is predefined with the primary on-demand mount point (/), which corresponds to the Helix Universal Server `Content` directory and its subdirectories.
3. If you've created other mount points as described in "Adding a Mount Point for On-Demand Clips" on page 83, you can add them to the **Browsable Mount Points** box by selecting them through the pull-down list.
4. The default value * in the **Extensions to Browse** box generates a content list for all clips and files, including SMIL files and metafiles such as Ram files. To limit the types of files shown, enter the file extensions in the box. Separate multiple extensions with a comma. For example, to browse just MP3 and RealMedia clips, you enter this:

   ```
   mp3, rm
   ```
5. Click **Apply** to save the changes.
6. Click the **Browse Content** link to generate a separate HTML page of all the selected content. The list includes content for all mount points shown in the **Mount Points to Browse** Box, not just the highlighted mount point. The list includes mount points, directories, and files, with file sizes listed in bytes. Clicking a link in the **Play** column plays a clip.

Displaying Source Information

Just as browsers have "view source" commands that display HTML markup, RealOne Player has a view source command (**View>Clip>Clip Source**) that displays SMIL markup and clip information for all content it plays. When a viewer gives this command, Helix Universal Server generates an HTML page that contains the SMIL markup (if used), as well as information about clips and live broadcast streams. RealOne Player displays this information in a native browser window. With RealPlayer 7 and 8, source information displays in the viewer's default Web browser.

> **Tip:** The view source command is a handy way to learn a clip's streaming bit rate. Just play the clip in RealOne Player, and use

the view source feature to display the clip's encoding statistics. SureStream RealAudio and RealVideo clips display all available bit rate streams.

Default Security Precautions

By default, source information is not divulged for any clip or presentation that requires user name and password validation. For other presentations, the source information hides clip locations. For example, when the viewer requests the source of a SMIL file, the browser's address box displays a URL that shows random numbers and letters in place of the SMIL file path:

```
http://helixserver.example.com:80/viewsource/template.html?ABcdlkj293847
```

The source page displaying SMIL markup links to separate pages that give information about each clip used in the presentation, including clip size, buffer time, and bit rate, but not the full path. To protect the location of content, the SMIL source page omits the full path to the clips, showing ellipses (...) instead. For example, the actual SMIL file on Helix Universal Server may have a source tag that gives the full URL to a video clip:

```
<video src="rtsp://helixserver.example.com/presentation/presentation.rm" .../>
```

In the SMIL source page that viewers see, the full path is hidden:

```
<video src="rtsp://.../presentation.rm" .../>
```

When you stream with Helix Universal Server, you have full control over what information you display for which clips. You can override defaults, for example, and display path information for all clips, or only for those in selected directories. Other methods of playing clips do not offer this full control, however:

- When viewers play clips residing on their local computers, RealOne Player generates the source pages itself, and always shows the full paths and all clip information.
- If a Web server delivers clips, RealOne Player generates the source pages itself, hiding the paths to media clips, but showing all other clip information.

Selectively Displaying Source Information

By default, the view source feature is turned on for all on-demand clips and broadcasts, except those that require user name and password validation. The

full paths to clips and files are not displayed, however. On a system-wide basis, you can turn off the view source feature, or decide to show full path information for all clips that do not require password validation. Or, you can set up selective rules to define exactly which on-demand clips and broadcasts display source information.

To enable selective rules, you define paths to content directories and broadcast mount points. The main on-demand mount point (/) is predefined to let you set up a source rule for the entire `Content` directory. You can add more rules for `Content` subdirectories, other on-demand mount points and subdirectories, and broadcast mount points such as `/broadcast/`. In applying view source rules, Helix Universal Server looks for the closest match. The examples in the following table illustrate how these rules work.

Examples of View Source Rules for the Main Content Directory

Path	View?	Result
`/`	`No`	Only clips in the `Content/news/` subdirectory (and any subdirectories under that) show source information.
`/news/`	`Yes`	
`/`	`No`	Only clips in the `Content/news/daily` subdirectory (and any subdirectories under that) show source information.
`/news/`	`No`	
`/news/daily/`	`Yes`	
`/`	`Yes`	All clips in the `Content` directory except those in the `news/` subdirectory show source information. However, clips in the `news/daily/` subdirectory (and any subdirectories under that) show source information.
`/news/`	`No`	
`/news/daily/`	`Yes`	

For More Information: See Chapter 7 for information about broadcast mount points.

Changing View Source Settings

The following procedure explains how to change the view source settings. You need to change these settings only if you want to modify the defaults to turn off view source entirely, for example, or to set up selective viewing rules.

➤ To change view source settings:

1. In Helix Administrator, click **Content Management>View Source**.

2. Set the appropriate features in the pull-down lists of the **Master Settings** section, as shown in the following table. These settings let you temporarily or permanently establish system-wide viewing rules.

View Source Master Settings

Menu	Option	Action
View Source	`Use Settings Above`	Apply selective view source rules.
	`Disable View Source`	Show no source information system-wide.
	`Enable View Source`	Show source information system-wide.
Hide Paths	`Use Settings Above`	Apply selective path rules.
	`Show All Paths`	Show paths for viewable clips.
	`Hide All Paths`	Hide paths for viewable clips.

If you want to enable selective viewing rules, select `Use Settings Above` as the master view source setting. You can use the master setting `Hide All Paths` or `Show All Paths` with selective rules. If you want to hide paths on a case-by-case basis, though, select `Use Settings Above`.

3. Perform this step if you want to define viewing rules, as described in "Selectively Displaying Source Information" on page 89. The **View Paths** box is predefined with the primary on-demand mount point (/), which corresponds to the `Content` directory in the main Helix Universal Server installation directory. Do the following to define a new path:
   a. Click the "+" icon to create a path listing.
   b. Change the name in the **Edit Path** box to the path that corresponds to the view source rule. If you want to set up a source rule for clips in a `Content/news/` subdirectory you've created, for example, you enter `/news/`. (The mount point "/" corresponds to the `Content` directory.)
4. In the **View Source** and **Hide Paths** pull-down lists, select the appropriate settings for the highlighted path. If you set **View Source** to `No`, the **Hide Paths** setting does not matter.
5. Click **Apply** to save your changes.

View Source Used with Other Features

The following table describes how the view source feature interacts with other Helix Universal Server features.

View Source Used with Other Helix Universal Server Features

Feature	View Source Interaction
Broadcasting	The view source feature applies to both on-demand and live content.
SLTA	On-demand files that are converted to live streams through SLTA show the same information as other live files.
Splitting	View source is disabled for users who are receiving a broadcast through a push splitting source.
Authentication	The view source feature is automatically disabled for all secure content.
Reporting	A record is created in the access log when a user makes a view source request. See the table "GET Statements for On-Demand Content" on page 344.

CHAPTER

6

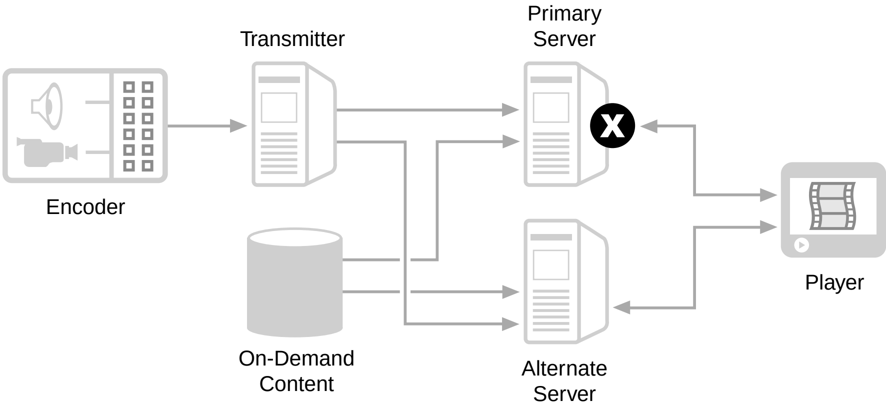
MULTIPLE SERVERS

There are many features that help you to manage large networks containing more than one Helix Universal Server. This chapter covers content caching, server redundancy, and proxies.

Implementing Redundant Servers

Normally, if an RTSP connection between RealOne Player and Helix Universal Server version 9.0 breaks, RealOne Player attempts to reconnect to the same server. With a redundant server setup, Helix Universal Server sends RealOne Player a list of alternate servers when it sets up the RTSP control channel. If a break occurs, RealOne Player uses its alternate list to connect to another Helix Universal Server that has the same content. If multiple alternates are available, RealOne Player selects one randomly. The following illustration depicts a RealOne Player failing over to an alternate Helix Universal Server.

Redundant Servers



Note: The redundant server feature works only with RealOne Player and later. It does not function with earlier versions of RealPlayer, or any other media players.

Redundant Server Requirements

There are three criteria for setting up redundant servers. You need to ensure that the same content is available on each server, and that each server defines a list of redundant servers, along with the rules for when to use them.

Cloned Content

Generally, all servers in a redundant cluster must offer the same content, whether on-demand or live. If a redundant server offers only some of the primary server's content, you'll need to set up rules on the primary server to define exactly which failures prompt RealOne Player to reconnect to the alternate server.

For More Information: You can use the content caching feature, described in "Content Caching" on page 96, to distribute on-demand content between servers.

Alternate Server Lists

Each Helix Universal Server defines a list of servers available for redundant failover. Typically, each Helix Universal Server in a redundant cluster identifies the other servers in the cluster. Helix Universal Server "A" fails over to Helix Universal Server "B" and Helix Universal Server "C," for example, while Helix Universal Server "B" fails over to servers "A" and "C". If connections to Helix Universal Server "A" fail, each disconnected RealOne Player chooses server "B" or "C" at random. This helps to balance the load if a heavily-used server becomes completely unavailable.

It is not necessary for each server to fail over to every other server in the cluster, however. Helix Universal Server "A" might fail over to Helix Universal Server "B", which fails over to Helix Universal Server "C", which fails over to Helix Universal Server "A". Because you define each server's failover list separately, you have a lot of flexibility over how to set up your redundant cluster.

Failover Rules

On each Helix Universal Server in a redundant cluster, you create rules to designate which alternate servers are used when a content stream fails. Because rules are attached to mount points, you can have URLs that use different mount points fail over to different servers, or not fail over at all.

Helix Universal Server searches for and applies rules in an assigned order. For this reason, you should put longer, more specific rules first. Generally, the shorter the rule, the broader its scope. For example, assigning the root mount point (/) to an alternate would result in *all* disconnects for on-demand content being redirected to that alternate.

The rule system also allows you to forbid the use of the redundant servers feature on a path-by-path basis. When you exclude a path, Helix Universal Server does not pass a list of alternate servers to RealOne Player while setting up the RTSP control channel. If RealOne Player experiences a disconnect when playing that content, it tries to reconnect to the same Helix Universal Server.

> **Note:** If you are use the ad serving extension, add the `/smilgen/` mount point to the exclude path list. The redundant servers feature does not work with dynamically generated ad content that appears under this mount point. For more information on dynamically generated ad content, see Chapter 15.

Setting Up Redundant Servers

The following procedure explains how to set up a redundant server list. Carry out this procedure on each server in your redundant cluster.

➤ To set up an alternate server:

1. In Helix Administrator, click **Server Setup>Redundant Servers**.
2. In the **Alternate Servers** box, click the "+" icon to add an alternate server. Then enter the following information:
   a. Enter any text that describes the alternate server in the **Description** box.
   b. Enter the alternate server's RTSP port in the **Port** box.
   c. In the **Host Name** box, enter the host name or dotted IP address of the alternate server.
   d. Repeat this step for all redundant servers.
3. In the **Redirect Rules** box, click the "+" icon to set up a redirect rule:
   a. Change the generic path name in the **Edit Rule Path** box to an actual path or mount point on your server. To use an alternate server as a failover server for all content, for example, enter the main content mount point:

/

b. Below the **Alternate Servers** box, choose from the pull-down list the servers that will act as failover servers for content served under this rule. The menu lists the servers already defined in the **Alternate Servers** section.

c. Repeat this procedure to define other redirect rules as necessary.

4. To exclude a path from any rule, click the "+" icon in the **Exclude Paths** section, and enter the path in the **Edit Path** box. For example:

   `/smilgen/`

5. Click **Apply**.

Content Caching

Content caching enables you to transfer on-demand streaming media content in any format between two or more Helix Universal Servers. This dynamic distribution improves playback quality by propagating the content closer to the viewer. It also reduces delivery cost by caching content at the network's edge. Distributing content is beneficial if you have large numbers of centrally located, on-demand media files, as well as a number of Helix Universal Servers distributed across your network.

> **Note:** Caching on servers and proxies works basically the same, but the usage is different. A proxy is used to get through a firewall. A server caches only static content, and works as described in this section. Caching works for all data types. However, if you cache a SMIL file, the content caching feature does not parse the file and cache the clips used in the SMIL presentation.

Understanding Content Caching

The following sections provide an overview of the content caching feature.

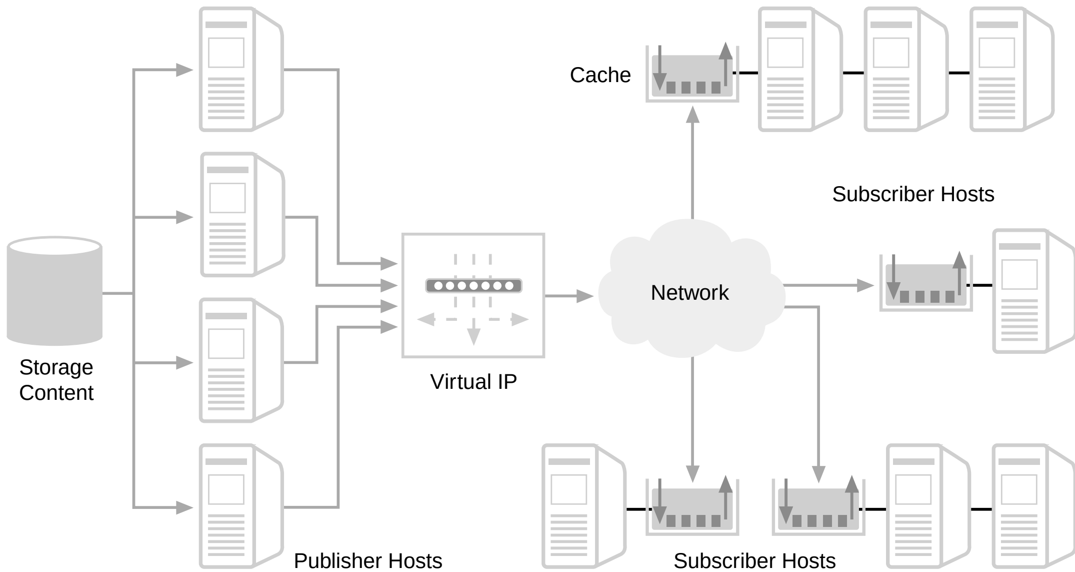
Publishers and Subscribers

In a caching network, you typically manage the bulk of your on-demand media from one or more Helix Universal Servers configured as *caching publishers.* Other Helix Universal Servers, called *caching subscribers*, contact the publisher for on-demand content. Each subscriber maintains a portion of

physical disk space for caching on-demand content originally deployed on the publisher.

When a media player requests on-demand content from a subscriber, the subscriber attempts to fulfill the request from its cache. If the content is not cached, the subscriber forwards the request to the publisher. As the publisher fulfills the request, the subscriber loads the content into its cache, and streams it to the media player. The following illustration shows a cluster of publishers behind a load balancing solution, delivering content to subscribers in different locations.

Content Caching



Load Balancing

RealNetworks recommends that you implement a load balancing solution for Helix Universal Servers acting as publishers. The minimum requirement is *DNS rotation*, sometimes known as *round robin DNS*. This technique involves associating multiple IP addresses to a single host name in the DNS record of the host. When the DNS server receives a request for the host name, it rotates through the IP addresses. Thus, the load for the host name is distributed between the IP addresses. Load balancing solutions often use a virtual IP address scheme.

For More Information: For recommendations about placing a cluster of Helix Universal Servers behind a virtual IP address, see "Working With A Virtual IP Address" on page 232.

Content Loading and Removal

Once publishers and subscribers are set up, content caching requires little administration. Initial setup can include preloading the cache. Subscribers then prune their caches with a "least recently used" (LRU) mechanism, which removes first those files that have not been requested for the longest time when the cache fills. This way, popular content remains readily available. Removing content from the publisher stops the content from being streamed throughout the network. A subscriber streams only the content that resides on the publisher, even if the content is still available in the subscriber's cache.

Security

Only trusted subscriber Helix Universal Servers may cache content from the publisher. During installation, Helix Universal Server sets up a content caching realm used on the publisher. The person who administers the publisher adds a unique user name and password to the content caching realm, and distributes these credentials to any subscribers set up to access the publisher. In addition to maintaining a secure channel between publisher and subscriber, the administrator of the publisher retains some control over the files served by the subscriber, even if those files already exist in the subscriber's cache.

For More Information: For information on the search logic between subscriber and publisher, see "Search Logic for Content Caching Rules" on page 101.

Bandwidth Conservation

Content caching ensures that only those portions of media files needed to fulfill a request are transferred from the publisher to the subscriber. In the case of SureStream media requests, only the byte ranges corresponding to the client-subscribed bit rates are transferred. In other words, when a client requests a SureStream clip from the subscriber, the subscriber determines the client bandwidth and requests from the publisher only the portion of the clip that best matches the request. This ensures that the connectivity between the content subscriber and content publisher is used efficiently, and that only requested data resides in the cache. If another client requests content that a

subscriber has just cached, but at a different rate, the subscriber adds the new bit rate data to the file.

Note: If the subscriber administrator preloads a SureStream clip, however, the entire file is loaded in the cache.

Links to Cached Content

Links to cached content use the same structure as links to regular on-demand content, with the following exceptions:

- The subdirectory structure in the link pointing to the *subscriber* must match the directory structure on the *publisher*
- A rule that defines the publisher's subdirectory structure must appear on the subscriber.

For More Information: For more information, as well as specific examples of links, see the section above, "Defining Subscriber Rules" on page 101.

Setting up Content Caching Publishers

There is little to set up on a Helix Universal Server content caching publisher. You must set up authentication. You must forward the user names and passwords of the `SecureCDist` realm to the subscriber administrator, and indicate the publisher's RTSP port and content mount points. This is so subscribers can create rules for publishers to use when caching content.

For More Information: For more on rules, see "Defining Subscriber Rules" on page 101.

Setting up Authentication on the Publisher

During installation, Helix Universal Server sets up a default content caching realm, creates a database of users, and populates the database with a default user name and password, which is the same user name and password used for initial access to Helix Administrator. You need to distribute a user name and password for the `SecureCDist` realm to the administrators of subscriber Helix Universal Servers for use when setting up subscriber Helix Universal Servers.

For More Information: See "Setting Up Realms" on page 264 for information about authentication realms.

Setting up Content Caching Subscribers

You set up subscriber Helix Universal Servers after you set up the publisher. Only two steps are required:

1. Define the publisher Helix Universal Servers associated with this subscriber, as well as a publishing hierarchy. For more information, see “Identifying the Publisher” on page 100.
2. Define rules for how subscribers access publishers based on the URL used by the client requesting content. For more information, see “Defining Subscriber Rules” on page 101.

> **Note:** As an option, you can also preload the subscriber cache with files from the publisher. See “Manually Populating a Cache” on page 104.

Designating Content for Content Caching

Designate content for caching by setting the content caching mount point flag. Content located under this mount point is then available to the subscriber. The subscriber then enters this mount into a subscription rule.

➤ To set a content caching mount point flag:

1. Click **Server Setup>Mount Points**.
2. Select the mount point where content available for content caching subscribers resides.
3. Select **Yes** from the **Cacheable by Caching Subscribers** box.

Identifying the Publisher

Each subscriber Helix Universal Server must have at least one publisher Helix Universal Server.

➤ To define the publisher:

1. Click **Content Management>Content Caching**.
2. Ensure that `Yes` appears for **Enable Content Fetching**. This enables the content caching feature.
3. Click the add new publisher button. A generic publisher description appears in the **Publisher Description** box.
4. In the **Host** box, enter the host name or IP address for this publisher.

5. In the **Port** box, enter the RTSP port of the publisher. (Most Helix Universal Servers use `554`).
6. In the **User Name** and **Password** boxes, enter the user name and password supplied by the administrator of the content caching publisher.
7. Click **Apply**. This adds a publisher node to the subscriber.

Defining Subscriber Rules

Content subscriber rules afford you more control over how content is distributed along your network. You can think of each rule as a subdirectory structure on the publisher that appears in request URLs. For example, consider the following URL:

`rtsp://subscriber.example.com/subdirectory/myfile.rm`

In this example, `/subdirectory/` is meant to be a subdirectory on the publisher that you add to the subscriber as a rule. When an incoming URL arrives at the subscriber, Helix Universal Server attempts to match whatever string it finds immediately following the host name.

Search Logic for Content Caching Rules

1. Search for the string in the local on-demand content directory (non-content caching) and its subdirectory structure. If a match is found, serve the file. If not, continue the search.
2. Search for the string in the content caching cache. If a match is found, serve the file. If not, continue the search.
3. Search for the string in the rules associated with publisher nodes from the top down. When a match is found, the string is handed off to the publisher. If no match is made, the request fails.
4. If the publisher finds the file, it serves the file to the subscriber's cache. The subscriber then serves the file to the media player from its cache. If the publisher does not find a match, the request results in an error.

In practice, however, if Helix Universal Server would have found a matching file in its cache, it would have immediately checked the publisher to ensure the file was still available. If the file had been removed from the publisher, the subscriber would not serve the file to the player, even though the file resides in cache. In this way, the administrator of the publisher has some control over the content available to subscribers.

For any of this to work, the string that appears in the URL must match a rule on the subscriber. That rule, in turn, must match the subdirectory structure on the publisher. Thus, the administrator on the subscriber must carefully coordinate with the administrator on the publisher. You can use the asterisk (*) as a wildcard character in rules. In fact, Helix Universal Server adds an implicit wildcard to the end of each rule it processes.

Perhaps the easiest method of setting up content caching is not to use any subdirectory structure at all. Just use the root of the publisher Helix Universal Server for storage all on-demand content, and then create a "/" rule on the subscriber. Consider the following example, meant to be typed directly into RealOne Player:

`rtsp://cdist_subscriber.helixserver.com:554/`**`myfile.rm`**

This URL combined with a content caching rule for "/" allows for the best of both worlds: *all* incoming URLs to the subscriber are matched against local content, and then run through the content caching regimen.

➤ To define content subscriber rules:

1. Click **Content Management> Content Caching**.
2. Ensure that `Yes` appears for **Enable Content Fetching**. This enables the content caching feature.
3. Ensure that at least one publisher is set up. If the correct publisher does not appear in the list, go to the procedure above, "Identifying the Publisher" on page 100, before continuing with this procedure.
4. Click the add new rule button. A generic rule name appears in the **Publisher Description** box. You may edit this name to whatever you like.
5. In the **Rule Path** box, enter the mount points flagged as **Cacheable by Caching Subscribers** on this subscriber. If there is an additional subdirectory structure under the mount point that will appear in your links, then add that structure to the rule, too.
6. Ensure that `Yes` is selected in the **Enable Rule** box.
7. Use the **Add Publisher to This Rule** pull-down list to add publishers to this rule. Repeat this step to add additional publishers. Make sure rules are valid for all publishers. Helix Universal Server searches for matches on publishers from top to bottom. If a publisher connection times out, Helix Universal Server attempts to connect to the next publisher in this list.

8. Click **Apply**.

Defining the Size of the Cache

The subscriber must have a cache to store files received from the publisher. By default, Helix Universal Server comes configured with a cache of 1000 megabytes. The size of the cache must be at least 11 megabytes. There is no maximum size restriction.

The cache is automatically pruned based on an least recently used (LRU) mechanism. This means that infrequently requested content is first discarded when the cache reaches its maximum size. If you restart Helix Universal Server, the LRU index is rebuilt based the contents of the cache at the time of restart.

Although there is no functionality to prune the cache with Helix Administrator, there are still ways of manipulating cache content. As has been discussed earlier, if you remove content flagged for content caching from the publisher, the subscriber will not serve that content to players, even if the content remains in cache. Eventually the content will be pruned by the LRU mechanism.

A more direct approach would be to simply delete files directly from the physical disk that holds the cache. Never do this while Helix Universal Server is running, however. Helix Universal Server stores cache contents in memory. Thus, deleting files while Helix Universal Server is running will create a consistency problem. Shut down Helix Universal Server and then delete.

➤ **To define the size of the subscriber Helix Universal Server's cache:**

1. Click **Content Management> Content Caching**.
2. In the **Maximum Cache Size** box, change the default value of 1000 megabytes to the size required. The cache has a minimum size limit of 11 megabytes. If a lower number is entered, Helix Universal Server ignores the value and uses 11 megabytes of disk space. The theoretical maximum limit for cache size is about nine quadrillion megabytes, but cache sizes in excess of ninety-nine million megabytes cannot be set in Helix Administrator.

Defining the Cache Location

The physical location of the subscriber is the value entered as the base path of the `/fsforcache/` mount point. You can change the base path of this mount point, but you should not change the name of the mount point itself.

➤ To define the location of the subscriber Helix Universal Server's cache:

1. Click **Server Setup>Mount Points**.
2. In the list on the left, select "`RNCache Local File System`".
3. To change the base path, type the new location of the cache in the **Base Path** box.
4. Click **Apply**.

Manually Populating a Cache

Administrators of subscriber Helix Universal Servers can manually make requests for content. This populates the cache with whatever content the administrator requires. One reason to preload content on the subscriber is so that when clients first start to request files, the publisher is not inundated with requests that all must be fulfilled over the content caching network.

When files are preloaded using the **Fetch These Clips** box described below, Helix Universal Server requests the entire file. In other words, Helix Universal Server requests all bit-rates for pre-loaded SureStream files. Once the files are pre-loaded into the cache, Helix Universal Server treats it like any other file in the cache, pruning based on an LRU mechanism.

> **Note:** In addition to preloading the cache from the network, you can also create a disk image of the content you want in cache, and then use that image to propagate cache contents from subscriber to subscriber. You should shut down Helix Universal Server beforehand, however. For more information about where Helix Universal Server stores the physical cache on disk, see "Defining the Cache Location" on page 103.

➤ To populate the subscriber cache manually:

1. Click **Content Management> Content Caching**.
2. Click **Populate Cache**.
3. In the **Fetch These Clips** box, enter the file names of the clips that you want loaded into the cache. Helix Universal Server uses the rules you have in place to fetch content. Hence, use a subdirectory structure that reflects rules you have already defined for publishers.

   For example, if `publisher1` has static content in its `/news/` directory that you want propagated to subscribers, you would add a `/news/` rule to

`publisher1`. To fetch content from `publisher1`, you would enter `/news/`*`filename`* in the **Fetch These Clips** box (where *`filename`* substitute the actual names of the files for pre-loading on the subscriber).

> **Note:** To manually populate a subscriber's cache, content caching subscriber must be completely configured, including having a least one publisher, one rule, and the **Enable Content Fetching** turned on. For more information, see "Setting up Content Caching Subscribers" on page 100.

Content Caching Used With Other Features

This section describes the ways in which content caching works with other features. As a general rule, content caching is comparable to on-demand streaming in how it works with other features.

Content Caching Used with Other Features

Other Feature	Notes
Live Delivery Methods: Unicasting, Simulated Live Broadcasting, Splitting, and Multicasting	Content caching and live broadcasting are mutually exclusive methods of delivering content
Helix Universal Proxy No Cache Directives	Cache directives are not honored for content caching. These are applicable only for proxy and intermediary devices.
Access Control and Individual User Authentication	Content is subjected to any conditional access rules that have been established on the subscriber Helix Universal Server.

Using a Media Proxy

You can use a proxy to cache or split all on-demand and live content hosted on Helix Universal Server. Using proxies optimizes bandwidth by rebroadcasting content on behalf of clients. For most content, this type of optimization poses no problem. However, there may be some broadcasts or on-demand presentations that you do not want cached or split by a proxy. This section discusses how to define directives for on-demand content and live broadcasts that prohibit proxy devices from caching or splitting streaming media.

For More Information: See *Helix Universal Proxy Administration Guide* for information on using Helix Universal Proxy.

Understanding Media Proxies

A media proxy is generally installed on an intranet or on an Internet Service Provider's (ISP) network. Media players, such as RealOne Player, are configured to use a proxy for all streaming media requests. When a person requests streaming media, the media proxy acts as an intermediary agent, making the request on behalf of the client. The proxy fulfills the request by locally caching on-demand media, or splitting a live broadcast. In this manner, the proxy conserves bandwidth between it and Helix Universal Server.

RealNetworks certifies third-party media proxies with Helix Universal Proxy technology. This certification ensures two things:

- media cached locally on the proxy is secure
- proxy-fulfilled media requests are always accounted for at the origin Helix Universal Server.

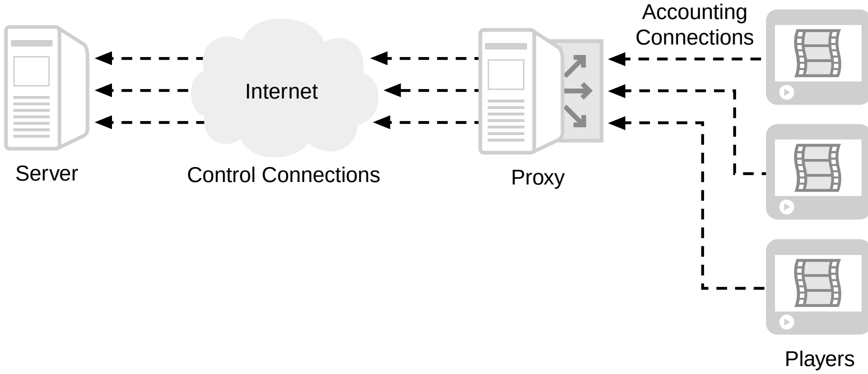
Reports for proxy fulfilled media requests can be accessed in real-time or through the access log. Make sure to choose a RealNetworks certified proxy for your network.

How Servers and Proxies Work Together

To use Helix Universal Proxy, all media players on the network must be configured to request media through the proxy. When the player makes the initial request for media, a two-way TCP control channel is established. The control channel is for the player software and Helix Universal Server to send information to one another, like rewind and pause commands or user names and passwords. Helix Universal Proxy forwards this initial request to the Helix Universal Server on behalf of the player. Helix Universal Server verifies the existence of the requested file, and whether the client is authorized to view it.

Meanwhile, Helix Universal Proxy monitors these control connections, so that it can account for all clients requesting content from the Helix Universal Server. For Helix Universal Proxy, the control channel is an *accounting channel*. It's the same TCP connection used by the player and server, but Helix Universal Proxy uses it in a different way. The following diagram illustrates multiple players connecting to a Helix Universal Server through Helix Universal Proxy.

Establishing the Accounting Connection



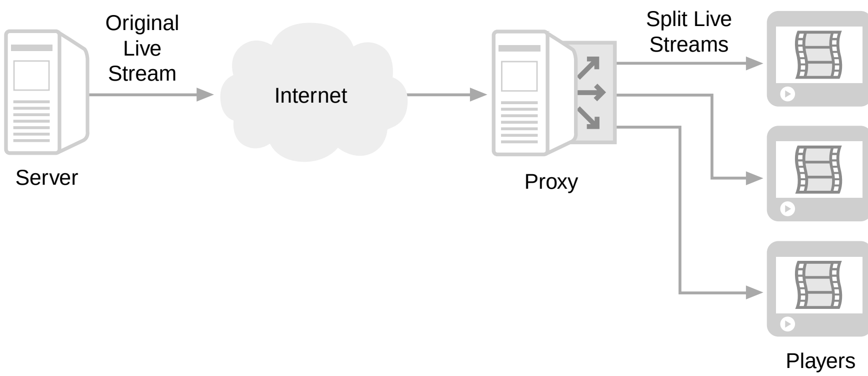
How Helix Universal Proxy Streams Content

With each player connected to Helix Universal Server in this manner, Helix Universal Proxy can begin streaming media. Helix Universal Proxy streams media based on the type of content being requested, and whether the Helix Universal Server administrator has placed any cache directives on content.

Helix Universal Proxy Replicating Live Content

If the stream is live, Helix Universal Proxy uses pull splitting to get an initial stream from Helix Universal Server. This stream is used to fulfill the initial RealOne Player request, as well as any additional requests. The source Helix Universal Server sends only a single stream to Helix Universal Proxy. The following diagram illustrates multiple live streams replicated by Helix Universal Proxy.

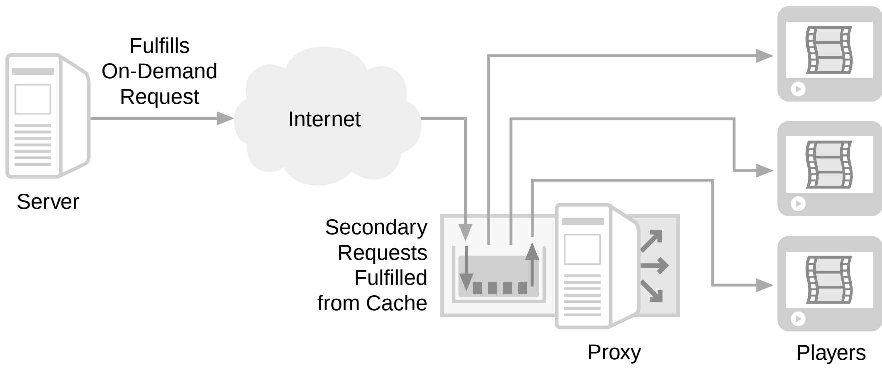
Helix Universal Proxy Replicating Live Streams



Helix Universal Proxy Delivering On-Demand Content

If the stream is on-demand, Helix Universal Proxy first tries to fill the request from its media cache. If the content is not yet stored in the cache, Helix Universal Proxy pulls the content from the source Helix Universal Server, simultaneously serving the client and filling the cache. The following diagram illustrates requests for multiple on-demand streams fulfilled by Helix Universal Proxy.

Helix Universal Proxy Streaming On-Demand Content from Cache



Cache Directives Restricting Helix Universal Proxy

For live or on-demand content, you have full control over what content is available to Helix Universal Proxy. If you have cache directives in place, Helix Universal Proxy functions differently than described above, depending on the type of content being restricted.

Cache Directives and On-Demand Content

If cache directives restrict on-demand content, Helix Universal Proxy does not cache content, nor does it fulfill requests for restricted media from its cache. Because the origin Helix Universal Server fulfills requests for restricted content, there is no bandwidth optimization.

Cache Directives and Live Broadcasts

If cache directives restrict a mount point for a live broadcast, Helix Universal Proxy does not rebroadcast a single stream pulled from the origin Helix Universal Server. Instead, it pulls a stream to fulfill each client request. Because the origin Helix Universal Server fulfills requests for restricted content, no bandwidth optimization occurs.

Restricting Proxies from Caching or Splitting Content

Unless you specify otherwise, all material on your Helix Universal Server is available to Helix Universal Proxy. Helix Universal Server has these options for restricting which Helix Universal Proxys can cache streams:

- preventing some paths, files, or mount points from being cached
- preventing certain Helix Universal Proxys from accessing your Helix Universal Server
- preventing all caching

Preventing Streams from Being Cached or Split

You can restrict paths, files, or mount points that Helix Universal Proxys can utilize. If Helix Universal Server receives a request for material included in the **Deny Cache Requests for these Resource Paths** list, it streams the file directly to the client rather than allowing it to be cached and re-transmitted. As always, Helix Universal Server records the transaction in the access log, and reports a bytes sent size of 0 bytes in the cached requests log file.

For example, you might choose to prevent material in authenticated content locations from being cached. Or, you might put the path to time-sensitive clips on this list so that it cannot be stored by Helix Universal Proxy.

> **Note:** Media caching software makes more streams available on your Helix Universal Server. If you limit clips to be cached, you also limit how many clients you can serve.

➤ To prevent Helix Universal Proxy from caching material on Helix Universal Server:

1. In Helix Administrator, click **Server Setup>Cache Directives**.
2. Under the **Deny Cache Requests for these Resource Paths** list, click the "+" icon. A generic path name appears in the list.
3. In the **Edit Paths** box, type the name of the path, file, or mount point for which you want to restrict content.
    - For example, if a subdirectory of the `Content` directory contained a directory named `news`, you would add `/news` to the **Deny Cache Requests for these Resource Paths** list. If you only wanted to prevent the late-breaking news clip from being cached, you would add the path and the file name instead (`/news/breaking.rm`).

- If you wanted to restrict live streams from being rebroadcast, you would add the mount point to be restricted.

4. Click **Apply**.

Preventing Helix Universal Proxy from Accessing Helix Universal Server

You can indicate that certain Helix Universal Proxys are not allowed to cache any of your material. To do this, you must know the IP address of the machine on which Helix Universal Proxy is installed.

> **Tip:** To find out which incoming requests are coming from a Helix Universal Proxy, look in the `rmaccess.log` file. You can identify Helix Universal Proxy request with `the client_id field of the rmaccess.log file.`

➤ **To prevent certain Helix Universal Proxys from making requests:**

Create an access rule for the Helix Universal Proxy you want to restrict. In addition to specifying the IP address, indicate the port number to which access should be denied (usually 554).

> **Note:** To learn about limiting access to your Helix Universal Server according to the IP address of any other computer, see “Understanding Access Control” on page 243.

Preventing All Caching

➤ **To prevent all caching of all material from all clients and Helix Universal Proxys:**

1. In Helix Administrator, click **Server Setup>Cache Directives**.
2. In the **Deny All Cache Requests** box, select **Disabled**.
3. Click **Apply**.

Cache Control Used with Other Features

This section describes how Helix Universal Server interacts with Helix Universal Proxy and other media proxy software.

How Helix Universal Server Features Work with a Media Proxy

Helix Universal Server Feature	Notes
On-Demand Streaming	You can mark on-demand content as non-cacheable, on a per-file or per-folder basis. Otherwise, all on-demand clips are automatically available to media caching software.
Live Broadcasts	You can create a directive for mount points, so that live broadcasts are not split by media caching software.
Access Control	You cannot restrict the IP addresses of an individual client computer. However, you can restrict the IP address of the Helix Universal Proxy that is requesting material on behalf of clients. See "Preventing Helix Universal Proxy from Accessing Helix Universal Server" on page 110.
Authentication	Before allowing clips to be cached, Helix Universal Server verifies whether the client is valid. If the requested material is marked as secured, it then performs any necessary authentication checks. Authenticated material can be stored in a Helix Universal Proxy cache, but the client will be authenticated with the source Helix Universal Server every time it tries to access the stored clip.
ISP Hosting	All on-demand material served on behalf of ISP-hosted customers can be cached, unless you mark those directories as non-cacheable (see "Preventing Streams from Being Cached or Split" on page 109).
Monitoring	The Java Monitor will show the IP address of the caching software as it plays a clip. The caching software is not identified as such. Rather, it appears to be a client.

(Table Page 1 of 2)

How Helix Universal Server Features Work with a Media Proxy

Helix Universal Server Feature	Notes
Reporting	To find out which incoming requests are coming from a Helix Universal Proxy, look in the `rmaccess.log` file. You can identify Helix Universal Proxy request with the `client_id field` of the `rmaccess.log` file.
Ad Streaming	All material served through the ad streaming feature is marked as non-cacheable. There is nothing you can do to prevent this.

(Table Page 2 of 2)

PART IV

BROADCASTING

This section explains how to broadcast events live. Once you understand the basics of live broadcasting, you can learn how to distribute your broadcast as widely as possible, using as little bandwidth as possible.

CHAPTER 7

UNICASTS

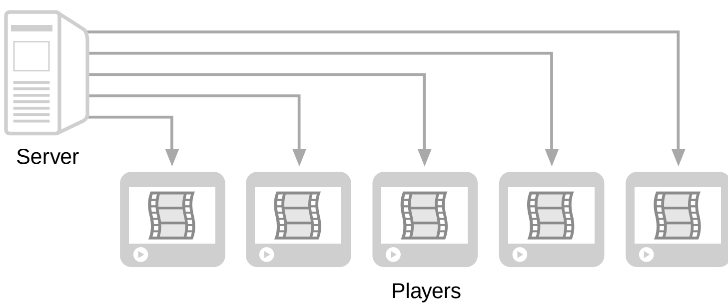
A unicast is the simplest way to broadcast a live event to viewers. Helix Universal Server can unicast events in RealMedia, Windows Media, and QuickTime formats, as well as in a number of RTP-based formats. You can use live unicasting for audio and video feeds delivered on the Internet or private intranets.

> **Tip:** See also Chapter 10 for information about delivering a prerecorded clip as if it were a live event. This is a good way to test broadcasting before streaming a live event.

Understanding Unicasts

Basic broadcasts are called *unicasts* because Helix Universal Server delivers a separate stream to each media player. An encoder such as Helix Producer encodes a real-time event in a streaming format. The encoder delivers the stream to Helix Universal Server, which then delivers the live stream to each media player, as shown in the following illustration. Viewers typically receive the broadcast by clicking a link in a Web page, just as they do for an on-demand clip. The link's format, though, instructs Helix Universal Server to deliver the live stream, rather than a prerecorded clip.

Unicasting



Licensing Limitations

Helix Universal Server can deliver multiple, simultaneous broadcasts in any combination of supported media formats, as long as the total number of players does not exceed the licensed maximum. On a Helix Universal Server licensed for 10,000 clients, for example, you can unicast the same live presentation in RealMedia format to 4,000 RealOne Players and in Windows Media format to 4,000 Windows Media Players. At the same time, you might unicast an entirely different live presentation to 2,000 QuickTime Players.

Bandwidth Constraints

In unicasting, each broadcast stream uses bandwidth, so you are also limited by Helix Universal Server's available, outgoing bandwidth. Unicasting from a single Helix Universal Server is generally suited, therefore, for light- to medium-volume broadcasts. For events with a large number of viewers, you can use splitting (see Chapter 9), multicasting (see Chapter 8), or a combination of the two, to deliver a large number of broadcast streams, or to conserve bandwidth.

> **Tip:** If you broadcast to RealNetworks media players on a multicast-enabled intranet, set up back-channel multicasting as described in Chapter 8. Players can then connect to a unicast in multicast mode, which saves on network bandwidth. If a player cannot receive the multicast, it requests a unicast.

Broadcast Trial Runs

When you broadcast live content, you don't get a second chance. It's good practice to perform a trial run to ensure that the equipment works properly and that the broadcast results are what you expect. Because you can't edit a live broadcast the way you can a prerecorded file, it's important to set your audio levels and plan your video shots carefully in advance.

During both the trial run and the live broadcast, view the broadcast output with the appropriate media player. When the player connects, check that the buffering time does not exceed 15 seconds. Throughout the presentation, keep an eye on the broadcast quality. If you experience problems during your trial run, you may need to reduce the number of streams if you are using a multiple-stream technology such as SureStream. Or, you may need to run the encoder on a more powerful computer.

Live Unicasting Used with Other Features

Live unicasting works with all other Helix Universal Server features. There are some considerations for each feature, however, as described in the following sections.

Firewalls

Live broadcasts use standard streaming protocols, so highly restrictive firewalls may block broadcasts. Firewalls are described in Chapter 11.

Access Control and Authentication

Before any client is allowed to receive any broadcast, Helix Universal Server checks the client's IP address to see whether the client is allowed to receive a broadcast. If the address is acceptable, Helix Universal Server looks at the location of the file to see if it is in a secure location. If so, Helix Universal Server challenges the user (or media player) for identification. Once the client passes the tests, Helix Universal Server connects the client to the live broadcast.

> **For More Information:** See Chapter 13 and the section "Securing Broadcasts" on page 257 for more information on setting up authentication for live broadcasts.

ISP Hosting

Helix Universal Server's ISP hosting feature can host on-demand content only. It does not host any live content.

Monitoring

You can view all streams and connections to broadcasts through the Server Monitor in Helix Administrator. Chapter 18 has more information.

Logging

The access log records all client connections to live broadcasts. The error log records any errors encountered by clients. See Chapter 16 for details.

Archiving Broadcasts

Helix Universal Server is preconfigured to archive broadcasts that use the RealMedia or MP3 format. It does not archive other broadcast formats, such as MPEG-4, Windows Media, and QuickTime. Archived files function just like prerecorded clips, and you can stream them on demand immediately after

they are recorded. Before you begin broadcasting with RealMedia or MP3, you may want to define archiving as described in this section.

> **Tip:** Helix Producer can also archive a stream on its local computer as it delivers the stream to Helix Universal Server. You can create the archive on that machine, on Helix Universal Server, or both. Typically, though, the Helix Universal Server computer has more disk space for archiving.

Selectively Archiving Broadcasts

Helix Universal Server is preconfigured to archive broadcasts to its `Archive` subdirectory. You just have to turn the archiving feature on for the "*" rule as described below. However, you may also want to set up different archiving rules. This allows you to archive only some broadcasts, as well as create archive files for different broadcasts in different directories.

The key to selective archiving is the encoder source path. When you broadcast a live stream, you can define an optional path name through the encoder interface. For example, you might define an encoder source path such as `news/`, along with the stream name `live.rm`. The `news/` source path does not correspond to an actual directory path on either the encoder or Helix Universal Server computer. It's just a name sent with the stream name that enables you to use various features, such as selective archiving rules.

You can set up any number of archiving rules. You might archive only the broadcasts that use certain source path names, for instance. Or, you can archive all broadcasts *except* those that use certain source path names. As well, you can archive all broadcasts, using the source path names only to indicate different archive directories. The following table shows possible combinations of using the general archiving rule, "*", along with two selective archiving rules that correspond to `news/` and `talk/` source paths.

Examples of Archiving Rules

Rule	Setting	Destination	Result
*	Enabled	/Archive/	All broadcasts except those with the `news/` and `talk/` source paths are archived in the `/Archive/` directory. Broadcasts using the `news/` source path are archived under the `/News/` mount point or directory, whereas those using the `talk/` source path are archived under `/Talk/`.
/news	Enabled	/News/	
/talk	Enabled	/Talk/	

(Table Page 1 of 2)

Examples of Archiving Rules (continued)

Rule	Setting	Destination	Result
*	Disabled	(any)	Only broadcasts using the news/ or talk/ source paths are archived. All archive files are created in the /Archive/ directory.
/news	Enabled	/Archive/	
/talk	Enabled	/Archive/	
*	Enabled	/Archive/	All broadcasts except those using the talk/ source path are archived. Archive files are created in the /Archive/ directory, unless they use the news/ source path. In that case, they are archived under /News/.
/news	Enabled	/News/	
/talk	Disabled	(any)	

(Table Page 2 of 2)

Setting Up Archiving

Broadcast archiving is not turned on by default. The following procedure explains how to activate archiving, define new archiving rules, and set up archiving options.

➤ To set up live archiving:

1. In Helix Administrator, click **Broadcasting>Live Archiving**.
2. Each entry in the **Source Paths** box sets up a different archiving rule. Helix Universal Server predefines the "*" rule, which automatically archives all broadcasts to the same directory. To archive all broadcasts, simply enable the "*" entry as described in the next step. To archive broadcasts selectively, create a new source path:
   a. In **Source Paths**, click the "+" icon to add a new path.
   b. Under **Edit Source Path**, enter the broadcast path name sent by Helix Producer. For more information, see "Selectively Archiving Broadcasts" on page 118.
3. From the **Archiving** list, select `Enabled` to activate the archiving rule selected in the **Source Paths** box.

   Tip: If you want to archive only selected broadcasts, be sure to choose `Disabled` for the "*" rule, and enable only the selective rules.

4. In the **Destination Path** box, indicate where Helix Universal Server stores the archived files for the selected rule. Encase the text in forward slashes, as in `/Archive/`. Helix Universal Server matches the entry to one of the following elements, searching for a match in the following order:

- **Mount point.** To archive files to another machine, set up a new on-demand mount point as described in "Adding a Mount Point for On-Demand Clips" on page 83
- **Directory path.** Directory names are relative to the `Content` directory. If the directory does not exist already, Helix Universal Server will create it. The default location is the `Archive` subdirectory under `Content`.

5. To create multiple archive files limited by size, enter the maximum size for each file in Megabytes in the **Limit Archive Files By Size** box. Archive files are numbered sequentially in the base file name. For example, if the broadcast stream is named `live.rm`, the first archive file is named `live0.rm`, the second is `live1.rm` and so on.

    Note: A number *after* the file extension indicates an earlier broadcast that used the same stream name as a later broadcast. See "Maintaining Archives for Repeated Broadcasts" on page 121 for more information.

6. To create multiple archive files limited by broadcast time, enter the appropriate time in the **Limit Archive Files By Time** boxes. To create a new archive file every 30 minutes during the broadcast, for example, enter `30` in the **Minutes** box. As with files limited by size, archive files limited by broadcast time are numbered sequentially.

    Tip: Generally, you limit archives by size or time. You can select both methods, however, to create archive files according to the first limit reached. For example, you can create a new archive file whenever the preceding file reaches 30 Megabytes in size, or has recorded 15 minutes of the broadcast, whichever comes first.

7. The **Bandwidth Negotiation** pull-down applies only to legacy encoders that use RealServer 5-style bandwidth negotiation. It does not affect current broadcast methods described in this chapter. Ignore this option if you do not use the legacy encoders for RealServer 5 or earlier.

    When this option is set to `On`, Helix Universal Server creates an archive directory using the stream name, including the file extension, sent by the legacy encoder. It archives the different streams in this directory, naming them for the compression algorithm. If this option is set to `Off`, Helix

Universal Server stores the first stream that arrives under the stream name, which should include the .rm extension. It does not archive the other streams.

> **For More Information:** See “Legacy Bandwidth Negotiation” on page 13.

8. Click **Apply**.

Maintaining Archives for Repeated Broadcasts

When you repeat a broadcast, such as a live news show rebroadcast each day, you can use the same stream name, and archive each broadcast in the same directory. In this case, Helix Universal Server automatically renames older archive files by appending a unique number after the file extension. For example, if the archive file `dailynews.rm` exists in the archive directory when Helix Universal Server begins to archive a new `dailynews.rm` stream, Helix Universal Server moves the existing archive to a name such as `dailynews.rm.86400`. The appended number is related to a timestamp, so larger numbers indicate newer files.

Streaming Archived Files

An archived broadcast file functions just like an on-demand clip, and you can stream it by writing links to it as described in Chapter 5. You can also use SLTA, which Chapter 10 describes, to rebroadcast archive files as if they were live events. It is easiest to stream the archive from the directory where you saved it, but you can also move it to a different directory. A Web page link to a RealMedia archive that resides in the default `Archive` directory looks like this:

```
http://helixserver.example.com/ramgen/Archive/concert.rm
```

If you saved several archive files for a single broadcast, streaming the entire event requires that you provide a Web page link to each archive. However, you can also list all archive files in order within a single Ram file to stream the entire archived broadcast. For more on Ram files, see “Using Metafiles” on page 77.

> **Tip:** When you list archives in order within a `<seq>` tag in a SMIL file, the sequence acts like a unified broadcast. That is, the RealOne Player timeline slider does not reset when each

archive file begins to play. For more information, see the SMIL sequences chapter of *Introduction to Streaming Media*.

Using Broadcast Redundancy

When broadcasting any media format, you can specify one or more backup encoders. Each encoder delivers the same stream name marked with a unique delimiter, such as `.1` or `.2`. When the encoders connect to Helix Universal Server to deliver their live event streams, they form a queue based on their connection order. Consider this example:

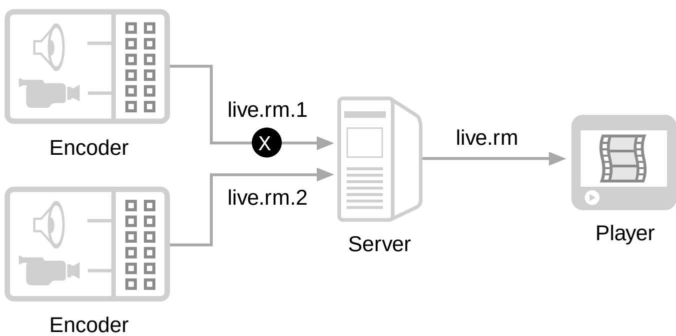
`live.rm.2` connects first

`live.rm.3` connects second

`live.rm.1` connects third

Under normal circumstances all media players receive the stream `live.rm`, and have no knowledge of the encoder sending the stream. In the preceding example, `live.rm` originates as `live.rm.2`. If the encoder delivering `live.rm.2` fails, media players reconnect to the next `live.rm` stream in the queue, which is `live.rm.3`. If `live.rm.2` returns, it goes to the bottom of the queue. A subsequent failure of `live.rm.3` causes media players to connect to `live.rm.1`, and so on.

Broadcast Redundancy



Support for encoder redundancy is enabled automatically, and requires no Helix Universal Server setup. The section on broadcasting a certain media format explains how to implement redundancy for that media format. RealNetworks recommends that you read the following sections, however, to understand better how encoder redundancy works.

Tip: To provide optimal redundancy, each encoder should be as independent as possible. For example, use multiple video cameras connected to separate computers that use different power supplies and network connections.

Modifying Encoder Redundancy Settings

Helix Universal Server is preconfigured to support redundant encoders for all media types. The following procedure explains how to change overall encoder redundancy settings in case you want to modify how this feature works with any media encoder.

➤ To modify encoder redundancy settings:

1. Click **Broadcasting>Broadcast Redundancy**.
2. If you want to turn off broadcast redundancy, choose `Disabled` from the **Broadcast Redundancy** pull-down list. Otherwise, leave this set to `Enabled`.
3. The character specified in the **Delimiter** pull-down list separates the stream names from the source numbers. For example, the primary RealMedia stream might be `live.rm.1`, while the backup is `live.rm.2`. The period delimiter is recommended, because it is the most extensible character in UNIX shells. However, you can choose any one of the following:

^	(carat)
'	(single quote)
~	(tilde)

4. The **Timeout** box sets the number of seconds that Helix Universal Server waits for an interrupted stream to return before switching to a backup stream. The default value is 2, but you can set a range from 0 to 30.
5. The **Reconnect** pull-down list specifies how viewers using RealOne Player and RealPlayer 8 receive the backup stream should the primary stream become unavailable. The default value `Auto` causes the media player to switch to the new stream automatically. Choosing `Manual` displays the message defined in the **Error Message** field, and requires users to click the **Play** button to switch to the new stream.

   Note: Viewers must reconnect manually, regardless of the setting in the **Reconnect** list if they are using a version of

RealPlayer earlier than RealPlayer 8, receiving a broadcast over the older PNA protocol, or using any other media player, such as Windows Media Player or QuickTime Player.

6. The **Mount Point** box defines the mount point to use in links to indicate that broadcast redundancy is used. The default value is `/redundant/`.
7. The **Error Message** field holds the text of the message that appears if **Reconnect** is set to `Manual`. This message should tell users how to connect to the new stream. The default message is:

   `Broadcast timed out; click Play button to restart.`
8. Click **Apply** to save the changes. You'll need to restart Helix Universal Server if you changed the mount point.

Using Broadcast Redundancy with Other Features

The following table explains how redundant broadcasting interacts with other Helix Universal Server features.

Broadcast Redundancy Used with Other Features

Other Features	Notes
SLTA	You can use redundant sources with SLTA.
Archiving	Helix Universal Server archives the incoming source, but doesn't store the source number. If sources are `live.rm.1` and `live.rm.2`, for example Helix Universal Server archives a file named `live.rm`, without the delimiter and number.
Splitting	A transmitter that uses the redundant encoders feature sends out its streams just like any other live broadcast. To create a system with multiple layers of backups, you should configure multiple transmitters to name their broadcasts with the same file name, plus the delimiter and a unique number.
Multicasting	Redundant live sources can be multicast, as with any other live content.
Access Control, Authentication	Use access control and authentication the same as with any other live content.

(Table Page 1 of 2)

Broadcast Redundancy Used with Other Features

Other Features	Notes
Java Monitor	Redundant sources are displayed like any other live broadcasts.
Reporting	Just as in any other live broadcast, a record is created in the access log for any client that connects to a live broadcast originating from redundant sources. You can't determine which redundant source is in use, only that the redundancy feature is in use. See "GET Statements" on page 343 to see how redundant sources appear in the access log.

(Table Page 2 of 2)

Broadcasting RealMedia

To broadcast RealAudio or RealVideo, you use Helix Producer to capture and encode the live event. If you have an earlier version of RealProducer, such as RealProducer 8.5, you can continue to use it to deliver live streams, as described in "Encoding with an Older Version of RealProducer" on page 128. The section "Setting Up Account-Based Broadcasting" on page 126 explains how to use Helix Producer 9 in a mode that emulates broadcasts originating from earlier versions of RealProducer.

Tip: Helix Producer 9 introduces new methods for delivering live streams, called *push mode* and *pull mode*. In these methods, Helix Producer 9 acts like a Helix Universal Server transmitter in a splitting arrangement. These modes are more powerful than the connection methods described in the following sections. They require more setup, though, and are described in Chapter 9.

Broadcasting with SureStream

Using SureStream technology, you can broadcast RealMedia at multiple bandwidths using any encoder from RealProducer G2 to the latest version. In a SureStream broadcast, each RealPlayer selects an encoding appropriate for its connection speed. To reach multiple bandwidth audiences without using SureStream, you run separate Helix Producer encoders (typically on separate machines), broadcasting each stream under a different stream name.

Note that when you archive a live broadcast that uses SureStream, Helix Universal Server creates several temporary files that correspond to different SureStream streams. It merges these temporary files into the final archived

file (or files) when the broadcast finishes. The merging time may take longer than the broadcast. Be sure not to stop Helix Universal Server or delete the temporary files before the merging completes.

For More Information: For more on archiving, see "Archiving Broadcasts" on page 117.

Using SMIL in Broadcasts

You can use SMIL 1.0 or SMIL 2.0 to add prerecorded content to a live broadcast. Within a SMIL file, you treat a broadcast like any other clip, furnishing a URL that points RealOne Player to the live stream instead of an on-demand clip. You can assign broadcast streams to SMIL regions, and group a broadcast with on-demand clips using `<seq>` or `<par>` tags.

SMIL can deliver an on-demand RealPix slideshow along with live RealAudio, for example, when both are in a `<par>` group. It cannot synchronize the on-demand clip with the live stream, however. This is because the on-demand clip's timeline starts when the viewer requests the presentation, whereas the broadcast stream's timeline starts when the broadcast begins.

To illustrate this, suppose that viewer A requests the presentation 2 minutes after the broadcast begins, and viewer B requests it 4 minutes after the broadcast begins. At 10 minutes into the broadcast, both viewers hear the same audio, but viewer A's RealPix clip is at its 8-minute mark, whereas viewer B's clip is at its 6-minute mark. Hence the relationship between the two timelines varies for each viewer.

For More Information: For more on SMIL, see *RealNetworks Production Guide*.

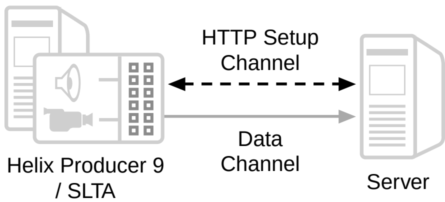
Setting Up Account-Based Broadcasting

If you are a broadcasting beginner, you can use Helix Producer 9 in its *account-based* mode. This mode, which is a simplified subset of the newer push mode, emulates the broadcasting connection used in previous versions of RealProducer. Although not as robust as the full-fledged push mode, it requires little setup, so it provides a good introduction to broadcasting RealMedia.

When Helix Producer connects to Helix Universal Server in account-based mode, it uses an HTTP connection to Helix Universal Server to discover the best way to communicate. Because this connection is authenticated, Helix

Producer needs a valid user name and password on Helix Universal Server. Helix Producer then sets up a data channel based on the most reliable network path it finds to Helix Universal Server.

Helix Producer 9 in Account-Based Mode



For More Information: See "Encoder Validation" on page 250 for information about setting up a user name and password to enable Helix Producer to connect to Helix Universal Server.

➤ To set up account-based broadcasting:

1. Click **Broadcasting >RealNetworks Encoding**. The necessary settings reside in the **9.0 Producer** section.
2. In the **Port Range** box, select the range of ports on Helix Universal Server where Helix Producer sends its live feed. Default values are `50001` to `50050`. Two ports are required for each live feed, so the default values allow up to 25 simultaneous connections. You may need to change or limit the port range to work around firewall restrictions, which are described in Chapter 11.
3. Helix Producer needs a valid user name and password to connect to Helix Universal Server. In the **Authentication** pull-down list, select the realm where you added user names and passwords for content creators. The default realm for Helix Producer is `SecureRBSEncoder`. The section "Managing Users and Passwords" on page 258 describes realms and authentication.
4. Click **Apply** to save the changes.

Note: You don't define a mount point with account-based broadcasting. The predefined mount point used for all account-based broadcasts is `/broadcast/`.

Starting the Account-Based Broadcast

Helix Producer initiates an account-based broadcast by contacting Helix Universal Server and delivering the encoded stream. Helix Producer has a server connection wizard in which you select push broadcasting, then specify an account-based login. You need to supply the Helix Universal Server IP address, as well as a user name and password set up under Helix Universal Server authentication.

In Helix Producer, you designate a stream name, and can include a path if you want to archive the stream selectively. If you use multiple Helix Producers for broadcast redundancy, start each encoder at the same time (or as close as possible). Ensure that each stream has the same stream name, a delimiter (a period by default), and a unique stream integer, starting with 1. For example, your stream names might be the following:

primary stream:	`live.rm.1`
backup stream:	`live.rm.2`

Note: Even though each stream has a delimiter and unique integer after its stream name, the link to the broadcast uses just the common stream name (`live.rm`).

For More Information: See *Helix Producer User's Guide* for instructions on setting up the encoder for broadcasting. To create the broadcast URLs, refer to "Linking to Unicasts" on page 134. The section "Using Broadcast Redundancy" on page 122 explains the use of multiple encoders.

Encoding with an Older Version of RealProducer

Helix Universal Server supports broadcast connections from earlier RealNetworks encoders. Although you typically do not need to change any Helix Universal Server settings, follow one of the procedures below to ensure that your Helix Universal Server setup is correct.

➤ To set up encoding with RealProducer G2 through 8.5:

1. Click **Broadcasting >RealNetworks Encoding**. The necessary settings reside in the **G2 to 8.5 Producer** section.
2. If you wish, you can change the **Mount Point** setting from the default `/encoder/`. Links to the broadcast include this mount point.

3. The **Port** box sets the port on which Helix Universal Server listens for the live broadcast stream. If you change this value, be sure to give the new value to the person running RealProducer.
4. The **Timeout** box sets the number of seconds that Helix Universal Server waits after a break in packet reception to shut down the connection and terminate the broadcast. The default value is 30 seconds.
5. To validate the encoder connection, select the name of the appropriate realm from the **Authentication** box. The default realm for encoders is `SecureEncoder`. See "Encoder Validation" on page 250 for information about creating encoder passwords.
6. Click **Apply** to save the changes. You'll need to restart Helix Universal Server if you changed the mount point.

➤ To use an encoder earlier than RealProducer G2:

1. Click **Broadcasting >RealNetworks Encoding**.
2. Click the **Setup** link at the top of the page.
3. If you wish, you can change the **Mount Point** setting from the default `/live/`. Links to the broadcast include this mount point.
4. The **Port** box sets the port on which Helix Universal Server listens for the live broadcast stream. If you change this value, be sure to give the new value to the person running RealProducer.
5. In the **Password** box, enter the password the encoder supplies to Helix Universal Server. Passwords are optional, and must be defined through the authentication feature. See "Encoder Validation" on page 250 for information about creating encoder passwords.
6. Click **Apply** to save the changes. You'll need to restart Helix Universal Server if you changed the mount point.

Starting the Legacy Broadcast

In legacy broadcasting, RealProducer initiates the broadcast by contacting Helix Universal Server. You supply the Helix Universal Server IP address, listen port, and a user name and password (if required). You designate a stream name, and can include a path if you want to archive the stream selectively. Legacy broadcasts can also use a backup encoder, with the two encoders specifying number-delimited stream names, such as `live.rm.1` and `live.rm.2`.

For More Information: See your *RealProducer User's Guide* for instructions on setting up the encoder for broadcasting. To set up broadcast URLs, see "Linking to Unicasts" on page 134. The section "Using Broadcast Redundancy" on page 122 explains the use of multiple encoders.

Broadcasting Windows Media

In a Windows Media broadcast, Helix Universal Server pulls a stream from Windows Media Encoder (version 7 recommended) over an HTTP connection, and delivers it to Windows Media Player clients over the MMS protocol. Helix Universal Server is preconfigured with support for the MMS, multiple bit rate (MBR) encoding, a Windows Media broadcast mount point, and an ASXGen mount point for launching Windows Media Player. Broadcasting in Windows Media format therefore requires little setup. Encoder redundancy is supported, but archiving is not.

➤ To set up a Windows Media broadcast:

1. Click **Broadcasting> Windows Media Encoding**.
2. The **Mount Point** box lists the default Windows Media mount point of `/wmtencoder/`, which will appear in broadcast URLs. RealNetworks recommends that you use this value. You need to restart Helix Universal Server if you change the mount point value. You can define only one Windows Media broadcast mount point on each Helix Universal Server, but you can deliver multiple broadcasts simultaneously through this single mount point.
3. In the **Windows Media Sources** list, click the "+" icon and edit the default text that appears in the **Source Description** box. Your entry should describe the Windows Media Encoder sending the stream. It is for your reference only, and is not included in URLs.
4. In the **Host** field, enter the IP address or host name of the Windows Media Encoder.
5. In the **Port** field, enter the HTTP Port of the Windows Media Encoder.
6. In the **Stream Name** field, enter a name for the Windows Media stream. The stream name, which appears in links to the broadcast, typically uses the same format as prerecorded clips, including a short base name, along

with the standard file extension, whether `.asf`, `.wmv`, or `.wma`. Optionally, you can precede the stream name with a path:

```
news/live.wmv
```

The path does not correspond to a physical path. Instead, you can use this when splitting the stream to direct it to some receivers but not others. For more information, see “Multiple Splitting Definitions” on page 174.

7. Repeat the preceding steps to set up another Windows Media broadcast, or to define a redundant encoder for the same broadcast. To use encoder redundancy, enter a stream delimiter after the extension, as in `live.wmv.1`. The backup stream should have the same stream name, but use `.2` as its delimiter.

    For More Information: See “Using Broadcast Redundancy” on page 122.

8. Helix Universal Server is ready to broadcast when you click **Apply**. It pulls the stream from Windows Media Encoder only on the first request from a Windows Media Player, however, so you can define encoders on this page before delivering broadcasts.

    Note: Helix Universal Server will broadcast the stream from the specified encoder as long as the full source is defined. To disable a broadcast after it completes, delete the source name, or clear the **Stream Name** field.

    For More Information: Consult your Windows Media Encoder documentation for information about setting up the live encoding process. To set up broadcast URLs, see “Linking to Unicasts” on page 134.

Broadcasting QuickTime, MPEG, and RTP-Based Media

Helix Universal Server can broadcast to the QuickTime Player streams that originate from the Sorenson Broadcaster, Apple’s Darwin Server, or Playlist Broadcaster. QuickTime broadcasting is based on the RTSP control protocol and the RTP packet format. Helix Universal Server’s support for RTSP and RTP enable it to broadcast other RTP-based media formats as well, including MP3 and MPEG-4. Helix Universal Server is preconfigured to support QuickTime and RTP-based media. You typically do not need to modify Helix Universal Server to broadcast these formats.

For More Information: For more on the RTP format itself, see "Packet Formats" on page 229.

Using SDP Files with Helix Universal Server

The heart of RTP-based streaming is the *Session Description Protocol* (SDP) file. The encoder produces this file, which provides general information about the encoded stream. The file is then delivered, usually by FTP, to a specific Helix Universal Server directory. Typically, Helix Universal Server pulls the stream from the encoder, based on information in the SDP file, when the first media player requests the broadcast. However, Helix Universal Server can also scan its SDP directory at regular intervals, cueing the broadcast when an SDP file arrives.

It's important to understand that media players do not receive the SDP file, even though the URL to the broadcast appears to link to the SDP file. The request URL uses the SDP file name to identify the broadcast. However, the request comes through a preconfigured Helix Universal Server mount point. This causes Helix Universal Server to send the media player information about how to connect to the broadcast stream on Helix Universal Server, rather than the original stream sent by the encoder.

Changing RTP Broadcast Procedures

To deliver an RTP-encoded stream, you typically do not need to change any Helix Universal Server settings. You may want Helix Universal Server to monitor for the arrival of the SDP file, though, so that it can cue the broadcast and speed the initial broadcast delivery. The following procedure explains how to modify broadcast settings.

➤ **To modify a QuickTime or RTP-based broadcast:**

1. Click **Broadcasting>QT & RTP Encoding**.
2. Two encoder descriptions are already predefined, one for QuickTime broadcasting and one for general RTP-based broadcasting. You can add another description by clicking the "+" icon in the **Encoders** section, then editing the name in the **Encoder Description** box.

   Tip: The two separate descriptions are for convenience. You can broadcast QuickTime using the general RTP mount point, or broadcast any RTP-based format using the QuickTime mount point. As well, you can create additional mount points.

3. In the **Mount Point** box, define the mount point used in the broadcast URL. By default, `/qtencoder/` and `/rtpencoder/` are predefined. For background on mount points, see "Mount Points" on page 74.
4. The **Base Mount Point** box defines a mount point or directory name that corresponds to the directory on Helix Universal Server where the encoder places the SDP file. The predefined entries are subdirectories under the main `Content` directory.

   > **Note:** If you indicate a different subdirectory or mount point, ensure that the specified directory exists before you restart Helix Universal Server.

5. For **Connection Timeout**, define the time in seconds that Helix Universal Server waits for the encoder to respond with a stream when the first media player requests the broadcast. If the timeout value expires before the encoder responds, Helix Universal Server terminates the broadcast. The default value is 10 seconds. You can set the value higher if you expect a higher initial latency.
6. The **End of Session Timeout** box defines the time in seconds that Helix Universal Server waits for the encoder to respond if it has stopped sending data but has not indicated that the broadcast has stopped. If the timeout value expires before the encoder responds, Helix Universal Server terminates the broadcast. The default value is 10 seconds. RealNetworks does not recommend setting this value lower.
7. By default, the **Enable SDP Directory Scan** pull-down is set to **No**, which causes Helix Universal Server to pull the stream from the encoder when the first client requests the broadcast. If you change this to **Yes**, Helix Universal Server scans the SDP file directory at regular intervals, connecting to the encoder and cueing the broadcast when it finds a new SDP file. Hence, Helix Universal Server prepares the stream on the arrival of the SDP file, helping to speed the delivery of the broadcast.

   > **Tip:** Because cueing the broadcast consumes resources even if no clients request the broadcast, RealNetworks recommends that you enable this feature only if you anticipate that the encoder will deliver the SDP file shortly before the first client requests the stream.

8. If you set Helix Universal Server to scan for SDP files, enter in the **SDP Directory Scan Interval** box the frequency in seconds that Helix Universal Server scans the SDP directory. The default is 5 seconds.
9. Click **Apply** to save the changes. Any changes in this page require a Helix Universal Server restart.

Starting the RTP-Based Broadcast

As it prepares to broadcast, the QuickTime or RTP-based encoder creates an SDP file that identifies the encoded stream. The broadcaster then delivers the SDP file to Helix Universal Server's SDP directory. The predefined SDP directories for QuickTime and RTP-based broadcasts, respectively, are at the following paths in a default installation of Helix Universal Server on Windows:

```
C:\Program Files\Real\Helix Server\Content\qtencodersdp
C:\Program Files\Real\Helix Server\Content\rtpencodersdp
```

On UNIX, the directories are under the `Content` directory of the main installation directory, as in these examples:

```
/usr/local/Real/HelixServer/Content/qtencodersdp
/usr/local/Real/HelixServer/Content/rtpencodersdp
```

Keep in mind that the broadcast request URL does not list the actual directory that contains the SDP file. Instead, it uses the appropriate mount point, which is typically either `/qtencoder/` or `/rtpencoder/`. For examples of this, see "QuickTime and RTP-Based Player Examples" on page 136.

> **Note:** You can create subdirectories for different SDP files if you want to split different broadcasts in different ways, as described in "Multiple Splitting Definitions" on page 174. The subdirectory name must then precede the SDP file name in the request URL

Linking to Unicasts

Links to live broadcasts look like links to on-demand clips, but use the broadcast mount points to direct the clients to live streams. Chapter 5 explains link formats in general. For information about the mount points to add to URLs to implement user name and password validation in broadcasts, see Chapter 13.

Linking from a Web Page

For a RealMedia or Windows Media broadcast, you can use the Ramgen or ASXGen utility described in "Using a Client Launch Utility" on page 78 to launch the appropriate client through a Web page link. The Web page URL uses the following format, in which the HTTP port is not required if Helix Universal Server uses port 80 for HTTP requests:

protocol://*address*:*HTTPPort*/ramgen|asxgen/*mount_point*/*path*/*stream_name*

RealMedia Link Examples

Using default values, a Web page URL to a broadcast originating from Helix Producer in account-based mode looks like this:

`http://helixserver.example.com/ramgen/broadcast/news/live.rm`

The `/broadcast/` mount point is the default. A path such as `news/` is optional. You include it only if Helix Producer specifies a path along with the stream name. You can use the path to select an archiving rule, for instance, or require user name and password authentication.

A broadcast originating from an earlier version of RealProducer uses the `/encoder/` mount point instead of the `/broadcast/` mount point. A Web page link looks like this:

`http://helixserver.example.com/ramgen/encoder/news/live.rm`

If you are using broadcast redundancy with any version of Helix Producer or RealProducer, use the `/redundant/` mount point instead of the `/broadcast/` or `/encoder/` mount point. Even though the streams have delimiters such as `.1` and `.2`, you do not use the delimiters in the URL:

`http://helixserver.example.com/ramgen/redundant/live.rm`

Windows Media Link Examples

Using default values, a Web page URL to a Windows Media unicast looks like this:

`http://helixserver.example.com/asxgen/wmtencoder/live.wmv.asx`

A broadcast that uses encoder redundancy looks like this:

`http://helixserver.example.com/asxgen/redundant/live.wmv.asx`

> **Tip:** See "ASXGen for Windows Media Player" on page 79 for information about the extra `.asx` extension used in Windows Media URLs.

Linking through a Metafile

You can also use media client metafiles, which are described in "Using Metafiles" on page 77, to request the broadcast. Links entered in a metafile, or typed directly into a media client, use the following format, in which the port value is not necessary if Helix Universal Server uses the default RTSP port (554) or MMS port (1755):

protocol://address:Port/mount_point/path/stream_name|SDPFileName

RealMedia Link Examples

In a Ram file or SMIL file, a URL to a broadcast originating from Helix Producer 9 in account-based mode looks like this:

```
rtsp://helixserver.example.com/broadcast/news/live.rm
```

Here, the `news/` path is optional, and specified along with the stream name by Helix Producer. A Ram or SMIL file URL to a broadcast originating from an earlier version of RealProducer looks like this:

```
rtsp://helixserver.example.com/encoder/news/live.rm
```

If you are using broadcast redundancy, use the `/redundant/` encoder mount point instead of the `/broadcast/` or `/encoder/` mount point. Even though the streams have delimiters such as `.1` and `.2`, you do not use the delimiters in the URL:

```
rtsp://helixserver.example.com/redundant/live.rm
```

Windows Media Link Examples

Windows Media broadcast links in an ASX file use the following format:

```
mms://helixserver.example.com/wmtencoder/live.wmv
```

A link to a broadcast that uses encoder redundancy looks like this:

```
mms://helixserver.example.com/redundant/live.wmv
```

QuickTime and RTP-Based Player Examples

URLs to QuickTime broadcasts used in a reference movie file, or entered directly in the QuickTime player, specify the SDP file used for the broadcast. Remember, though, that the media player does not request the SDP file from the directory where the file resides. Rather, it requests the file through the broadcast mount point, as shown here:

```
rtsp://helixserver.example.com/qtencoder/QTbroadcast.sdp
```

Links to general RTP-based broadcasts look like this:

```
rtsp://helixserver.example.com/rtpencoder/RTPbroadcast.sdp
```

If encoder redundancy is used, a link looks like this:

```
rtsp://helixserver.example.com/redundant/QTbroadcast.sdp
```

Playing a Standby Message

If a live broadcast has not started, or is interrupted and has not returned when a viewer tries to reconnect, you can send a message that indicates general information about the broadcast, such as when it is scheduled to play, and what viewers can do if the stream is interrupted. You do this by making a file that contains the message you want to display, and placing it in a subdirectory with the same name as the live mount point.

➤ **To create a standby message:**

1. Under Helix Universal Server's content directory, create a subdirectory with the same name as the live mount point. Keep in mind that the live mount point depends on the type of RealNetworks encoder being used. To support all default broadcast mount points, you would create the following subdirectories in a default installation of Helix Universal Server on Windows:

   ```
   C:\Program Files\Real\Helix Server\Content\broadcast
   C:\Program Files\Real\Helix Server\Content\encoder
   C:\Program Files\Real\Helix Server\Content\wmtencoder
   C:\Program Files\Real\Helix Server\Content\qtencoder
   C:\Program Files\Real\Helix Server\Content\rtpencoder
   C:\Program Files\Real\Helix Server\Content\redundant
   ```

   or on a typical installation on UNIX:

   ```
   /usr/local/Real/HelixServer/Content/broadcast
   /usr/local/Real/HelixServer/Content/encoder
   /usr/local/Real/HelixServer/Content/wmtencoder
   /usr/local/Real/HelixServer/Content/qtencoder
   /usr/local/Real/HelixServer/Content/rtpencoder
   /usr/local/Real/HelixServer/Content/redundant
   ```

2. Create a clip in the same format as your broadcast, such as RealAudio, RealVideo, Windows Media, or QuickTime, that contains the message to stream if the broadcast is not available.

Tip: You may want to include information about when the visitor should check back, keeping in mind the different time zones in which viewers may reside.

3. Place the appropriate standby clip in each of the subdirectories. Then, if a live stream fails to arrive, Helix Universal Server searches for the actual directory and clip that matches the broadcast mount point and stream name in the URL. In other words, it streams the prerecorded clips that use the stream names and that reside in the content subdirectories that mimic the broadcast mount points.

CHAPTER

8

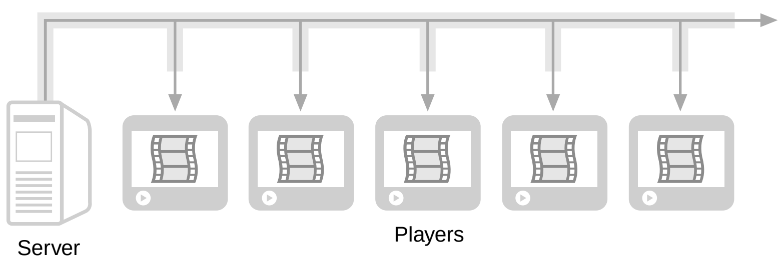
MULTICASTS

Multicasting is an alternative to unicasting that reduces the number of broadcast streams in use. Although it can increase the audience for a live event by reducing the broadcasting bandwidth, it requires a specially configured network, and is more suited for intranets than Internet delivery. You can multicast RealMedia, QuickTime, Windows Media, MPEG, and a number of RTP-based formats.

Understanding Multicasts

As Chapter 7 explained, unicasting delivers a unique broadcast stream to each media player. In contrast, multicasting sends a single live stream to multiple players. The multicast can be a live event, or a prerecorded clip broadcast by SLTA, which Chapter 10 explains. The players connect to the stream, rather than to the Helix Universal Server, as shown in the following illustration.

Multicasting

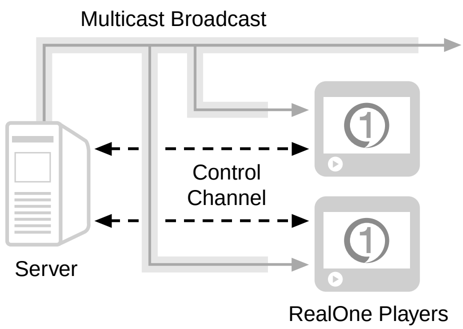


Back-Channel Multicasting

Back-channel multicasting works with all RealNetworks media players, including older players that use only the PNA protocol. In this method of multicasting, each media player maintains a control channel to Helix Universal Server. A media player uses its channel to send commands such as **Stop**, and to deliver statistics about the quality of service to the archive log.

The channel lets Helix Universal Server receive a user name and password if authentication is used. It also enables the Server Monitor described in Chapter 18 to track how many players are viewing the multicast.

Back-Channel Multicasting



Note: Because each player uses a control channel, back-channel multicasting is limited to the number of client connections licensed to your Helix Universal Server.

Unicast Failovers

If a RealNetworks media player is not multicast-enabled, or cannot connect to the back-channel multicast, it fails over to a unicast automatically. This ensures that all players can receive the broadcast. Because each unicast stream consumes extra bandwidth and Helix Universal Server overhead, you can choose to disable the failover feature and provide just the multicast. In this case, a player not able to participate in a multicast receives an error message when attempting to connect to the broadcast.

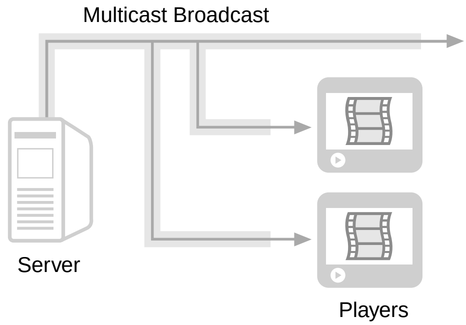
Tip: You can use back-channel multicasting with the failover feature for all broadcasts to RealNetworks media players. By default, players attempt a back-channel multicast connection first, switching to unicast if the failover feature is enabled, and the multicast is not available. Hence, enabling an automatic multicast for all broadcasts can help conserve bandwidth.

Scalable Multicasting

Using a scalable multicast, you can broadcast to an unlimited number of media players because the transmission is one-way. Unlike back-channel multicasting, scalable multicasting does not use a control channel. Thus, it

uses less bandwidth, administrative overhead, and system resources on Helix Universal Server. Scalable multicasting works with RealPlayer G2 and later. You can also multicast to any RTP-based media player that complies with scalable multicasting standards, including Apple's QuickTime Player.

Scalable Multicasting



Session Description Files

Viewers connect to scalable multicasts by clicking a link to a Session Description Protocol (SDP) file, which Helix Universal Server automatically generates. All data is multicast on the network once, and media players do not connect to Helix Universal Server during the multicast. Because of this, tools such as Server Monitor do not track client connections and activity during the broadcast.

Authentication and Statistics

Because media players do not connect to Helix Universal Server directly during the multicast, you cannot enforce user name and password validation in a scalable multicast. Optionally, you can have players connect to Helix Universal Server or a Web server to deliver quality of service statistics when the broadcast ends (or they disconnect).

Unicast Failovers

Like back-channel multicasting, scalable multicasting has a failover feature that lets you direct RealNetworks media players to a unicast if they cannot receive the multicast. You can provide a unicast on the same Helix Universal Server that hosts the multicast, or choose a different Helix Universal Server. As well, you can direct players to a Web page that indicates that the multicast is not available, and provides information about broadcast alternatives.

Windows Media Multicasts

Helix Universal Server can deliver scalable multicasts in the Windows Media format to Windows Media Players. Each multicast is pulled from Windows Media Encoder, and made available to players on a single multicast channel. Players click a Web page link to an NSC file to join the multicast. You can designate a unicast URL for players that cannot join the multicast. Unlike with RealMedia back-channel multicasts, Helix Universal Server cannot make all Windows Media unicasts automatically available as multicasts. As well, archiving of Windows Media multicasts is not supported.

Network Configuration for Multicasts

To use multicasting, Helix Universal Server, media players, routers, switches, and all other networking devices between them must be multicast-enabled. For this reason, multicasting is primary used on intranets. However, it is possible to deliver multicasts over the Internet where intermediary network devices have been multicast-enabled. Before using multicasting, verify the following with your network administrator:

- Routers and all equipment in your network are multicast-enabled.
- The machine running Helix Universal Server is correctly configured for multicast support.

> **Tip:** RealNetworks and Microsoft media players are configured for multicast by default, although viewers can turn off multicast support in their player preferences.

Multicast Addresses

A multicast requires the use of a continuous range of multicast addresses on your network. Valid ranges are between `224.0.0.0` and `239.255.255.255`. Check with your network administrator about which multicast addresses are available on your network. On the public Internet, certain ranges in the multicast address space (from `224.0.0.0` to `224.0.0.255`) are reserved, and cannot be used.

The number of addresses required for a multicast depends on the type of multicast you use, as well as the number of streams you deliver. For scalable multicasting, you also need to reserve a number of Helix Universal Server ports for the broadcast. The sections on setting up each type of multicast explain the number of addresses and ports you need.

Warning! If you use multiple types of multicasts, such as both back-channel and scalable multicasts, the address ranges you pick cannot overlap.

Packet Time to Live

All multicast broadcasts include a "time to live" feature. As a multicast data packet passes through a multicast-enabled router, its time to live decreases by 1. When the value reaches 0, the router discards the data packet. When you set up a multicast, you specify a time to live of `0` to `255`. The larger the value, the greater the distance a packet can travel. The default value of `16` typically keeps multicast packets within an internal network. The following table summarizes possible values.

Time to Live (TTL) Values

TTL Value	Packet Range
`0`	local host
`1`	local network (subnet)
`16`	intranet
`32`	site
`64`	region
`128`	continent
`255`	world

Multicasts with Multiple Network Interface Cards

If your Helix Universal Server machine has multiple network interface cards (NICs), and you want to ensure that Helix Universal Server always uses a particular NIC for multicasts, use your operating system to set a default address. On Windows, set IP bindings as described in "Binding to an IP Address" on page 62. On UNIX, use the **route** command to associate the multicast route with the appropriate NIC.

Multicasting Used with Other Features

The following sections summarize how multicasting works with other Helix Universal Server features.

Splitting and Multicasting

Transmitters can multicast a stream to receivers, as explained in Chapter 9. This does not require the setup described in this chapter, which concerns only server-to-player multicasts. If the receiver multicasts a stream to media players, however, you must configure the receiver for multicasting as described in this chapter.

Live Archiving and Multicasting

As with all live broadcasts, you can configure Helix Universal Server to archive files for live multicasts in the RealMedia or MP3 format. Helix Universal Server does not archive MPEG-4 or Windows Media multicasts.

Simulated Live Broadcasts with Multicasting

You can multicast a simulated live stream from on-demand clips using SLTA, which Chapter 10 describes.

Helix Universal Proxy and Multicasting

Depending on how the network is configured and the streams are listed in Helix Universal Server, clients whose requests are forwarded by a Helix Universal Proxy may receive different results.

Helix Universal Proxy cannot join a multicast. Instead, it will try to receive the multicast using pull splitting. If pull splitting is enabled on the source Helix Universal Server, Helix Universal Proxy will use that broadcast, instead of connecting to the multicast. The client will receive the broadcast in unicast mode.

If there is a multicast-enabled network between Helix Universal Proxy and the client, Helix Universal Proxy can be configured to re-send its pull split stream by multicast instead.

> **For More Information:** Refer to *Helix Universal Proxy Administration Guide* for information on configuring Helix Universal Proxy.

Firewalls and Multicasting

Multicasts usually take place within an intranet, where broadcasts are not traveling outside a firewall. If a multicast passes through a firewall, the firewall must be specially configured to allow multicast traffic.

Access Control, Authentication, and Multicasting

As with all delivery methods, Helix Universal Server verifies that the client requesting a broadcast is allowed to receive it. If you include the authentication mount point (`/secure/`) in the link, Helix Universal Server verifies the viewer's identity. You cannot authenticate scalable multicasts, however.

Reporting and Multicasting

Streams served through back-channel multicasts appear in the access log just like unicast material. The access log shows which method was used to transmit the stream. Scalable multicasts can be identified in the access log by their mount point in the `GET` statement. If Helix Universal Server is configured for requesting client statistics (see "Gathering Client Statistics" on page 150), the log file will also contain statistics for each client.

Multicast Resources

The Helix Universal Server implementation of back-channel and scalable multicasting is based on open industry standards. You may find the following resources useful.

General Multicasting Information

- **Addresses available for multicast use—"**Assigned Numbers," RFC 1700, available at **http://www.ietf.org/rfc/rfc1700.txt**.

Scalable Multicasting Information

- **RTP—** "RTP: A Transport Protocol for Real-Time Applications," RFC 1889, available at **http://www.ietf.org/rfc/rfc1889.txt**.
- **RTP—**"RTP Profile for Audio and Video Conferences with Minimal Control," RFC 1890, available at **http://www.ietf.org/rfc/rfc1890.txt**.
- **SDP (Session Description Protocol)—**"SDP: Session Description Protocol," RFC 2327, available at **http://www.ietf.org/rfc/rfc2327.txt**.
- **SAP (Session Announcement Protocol)—**"Session Announcement Protocol: Version 2," available at **http://www.ietf.org/rfc/rfc2974.txt**.

Defining Back-Channel Multicasting

Back-channel multicasting is enabled by default, though you need to specify multicast addresses for it to work. You can use this method to multicast any media format that RealNetworks media players can play. Once you've set up multicasting, players attempt to connect in multicast mode first, using a unicast if the cannot connect to the multicast. This helps to save bandwidth by providing the most efficient possible connection for each player.

Calculating Address Requirements

Determining the number of addresses you need for a back-channel multicast is straightforward. You need just one address per bit rate, regardless of the number of streams. So although a single-rate video technically delivers two streams, one for the audio track and one for the visuals, both tracks can use the same address.

SureStream Broadcasts

For SureStream, you need to reserve one address for each bit rate encoded into the stream. If a SureStream stream is encoded for three audience bandwidth targets, for example, you need three addresses. The duress streams encoded for a particular bandwidth target are not used, and do not require additional addresses.

> **Note:** Media players cannot shift between SureStream streams during the multicast.

Automatic Multicasts

If you intend to leave back-channel multicasting on for all broadcasts, you need enough multicast addresses to accommodate your typical broadcast. It's a good idea to implement a policy, such as using only two bandwidth targets when broadcasting RealVideo. If you have not reserved enough addresses for a particular multicast, the event is unicast automatically, as long as you have not disabled the failover feature.

Configuring Back-Channel Multicasting

The following procedure describes how to set up Helix Universal Server for back-channel multicasting. Minimally, you need to define your multicast address range. Other features are optional.

➤ To set up back-channel multicasting:

1. In Helix Administrator, click **Broadcast Distribution> Back-Channel Multicasting**.
2. The **Enable Multicast** list turns on this feature. Ensure that the default value of `Yes` is selected. If you set this to `No`, multicasting is disabled, and all media players use unicasting for all broadcasts.
3. Set the **Enable SAP** list to `Yes` to announce the multicast session, as described in "Publicizing Your Multicasts" on page 159.
4. In the **PNA Port** box, enter the port number on media clients where Helix Universal Server directs PNA multicast streams. The default is `7070`. PNA is used only with media clients earlier than RealPlayer G2, such as RealPlayer 5. These clients cannot play SureStream or SMIL.
5. In the **RTSP Port** box, list the port number on media clients where Helix Universal Server directs RTSP multicast streams. The default is `3554`.
6. Specify the range of addresses to which you want to multicast streams by filling in the **IP Address Range** box. Helix Universal Server uses the first available addresses in this range. See "Calculating Address Requirements" on page 146 for information about the number of addresses you'll need.
7. Indicate how far multicast packets can travel over a network by typing a value in the **Time to Live** box. For more information, see "Packet Time to Live" on page 143.
8. To allow missing packets to be resent to clients that request them, select `True` from the **Resend** list. Resending packets adds network overhead, but delivers higher-quality multicasts.
9. If you want to deliver the broadcast through multicasting alone, choose `Yes` from the **Multicast Delivery Only** list. Media players that cannot use multicasting will not be able to connect to the broadcast. Use this feature when broadcasting only to multicast-enabled media players, or if you are multicasting a high-bandwidth presentation and do not want to provide a unicast option.

    Warning! Selecting this option prevents you from unicasting any broadcast to RealNetworks media players. If you want to reuse unicasting after your multicast, turn this option off when the multicast ends.

10. The **Access Rules** section lets you restrict the range of media players that can connect to the multicast. A predefined rule allows all multicast-enabled players with access to the broadcast URL to connect to the multicast. You can delete this rule, modify it, and set up other rules as necessary:
    a. To add a new rule, click the "+" icon and, optionally, change the default name in the **Edit Client Access Rule Description** box. Because the access rules simply list addresses of media players that have access, the order of the rules in the **Access Rules** box does not matter.
    b. For the highlighted rule, enter an IP address or domain name for acceptable players in the **Client IP Address or Hostname**. The value `Any` is predefined for the first rule, meaning that all IP addresses are accepted. To restrict the range, delete the rule, or change its value and set a netmask.
    c. In **Client Netmask**, specify the range of client IP addresses around the one you entered in the preceding step by selecting a bit mask. If **Client IP Address** is set to `Any`, though, leave **Client Netmask** set to `None`. See Appendix B for details about assigning a range of IP addresses using a bit mask.
11. Click **Apply**.

> **Tip:** General access control rules, which are described in Chapter 12, are enforced before multicast access rules. A media player excluded by general access control will not connect to any multicast, regardless of the multicast access rules.

Starting a Back-Channel Multicast

After you configure a back-channel multicast, you start a unicast as described in Chapter 7. Media players that can connect to the multicast do so. Players that cannot connect to the multicast use a unicast, as long as the failover feature is not disabled. Links to both RTSP and PNA multicast are identical to links for unicasts. This enables a single link to serve both multicast and unicast clients. For information on linking formats, see "Linking to Unicasts" on page 134.

Setting Up Scalable Multicasting

This section describes how to set up a live channel to broadcast to any number of media players that support the RTP packet format and the scalable multicasting standards. This includes RealOne Player and Apple QuickTime Player. You can multicast any audio or video format that plays in the media players used by your audience.

For More Information: The section "Multicast Resources" on page 145 directs you to information about multicasting standards.

Determining the Number of Addresses and Ports

You must reserve a contiguous block of IP addresses and a continuous range of Helix Universal Server ports for a scalable multicast. The number of addresses and ports you need is based on the number of streams you broadcast. The following sections describe how to calculate the numbers of addresses and ports you'll need.

Note: The multicast addresses you choose cannot overlap with addresses assigned to back-channel multicasts.

Single-Rate Audio and Video

A single-rate audio broadcast uses one stream, requiring one address. A single-rate video contains at least two streams, one for the audio track and one for the visual track. It may also have an event stream used to open URLs, for instance. The scalable multicasting specification requires an address for each stream. However, Helix Universal Server has a default **Reuse Address** feature that lets you use just one multicast IP address for each single-rate video, whether or not it includes an event stream. RealNetworks recommends that you use this feature unless you have a specific reason not to do so.

Note: The **Reuse Address** feature works only with RealNetworks media players.

Tip: Using multiple addresses is useful if media players use a low-bandwidth connection, and are able to play just the audio track of a video stream.

SureStream RealAudio and RealVideo

For SureStream, you need to reserve one address for each encoded bit rate. If a SureStream RealAudio broadcast is encoded for three bandwidth targets, for example, you need three addresses. If you broadcast RealVideo and are not using the **Reuse Address** feature, you need two addresses for each rate. If a SureStream RealVideo broadcast is encoded for three audience bandwidth targets, for example, you need three addresses if the **Reuse Address** feature is used, six addresses if it isn't. The duress streams encoded for a particular bandwidth target are not used, and do not require additional addresses.

> **Note:** Media players cannot shift between SureStream streams during a multicast.

Port Ranges

Scalable multicasts require a continuous, even-numbered range of ports. The number of ports required depends on the media type, and the number of bit rates encoded in the stream. You need to reserve two ports for each data stream:

- For video, reserve four ports for each encoded bit rate (two ports for each audio track, and two for each visual track) regardless of whether you use the **Reuse Address** feature. SureStream RealVideo with three encoded bit rates, for instance, needs 12 data ports.
- For audio, reserve two ports for each encoded bit rate. For SureStream RealAudio with three encoded bit rates, for example, you need 6 ports for data.
- An audio or video stream may also have an events stream, which requires an additional two ports. With RealAudio or RealVideo, for instance, an event stream can automatically open URLs in the viewer's Web browser.

> **Tip:** You can determine a clip or unicast stream's encoded bit rate (or rates) by playing the clip or live stream in RealOne Player, and giving the **View>Clip>Clip Source** command.

Gathering Client Statistics

RealNetworks media players can transmit statistics about the amount and quality of data they received during a scalable multicast. As with unicasts, client statistics are sent at the end of a presentation (or when the player disconnects), and are stored in the access log described in Chapter 16. Once

you have gathered statistics, you can draw conclusions about the quantity of clients and quality of service.

Because scalable multicasts can serve many thousands of players, your Helix Universal Server may not be able to handle all of the statistics connections at the end of the session, either because of load or client licensing limitations. In this case, you can limit the amount of information sent to Helix Universal Server (though not the number of connections), or offload the task to a Web server.

Limiting Statistics

Under **Logging & Monitoring>Access & Error Logging**, you can control the type of data sent at the end of a scalable multicast by modifying the **Client Stats** setting. You can instruct clients to send minimal data by setting **Logging Style** to `0` and by clearing any **Client Stats** settings. The section "Logging Style" on page 334 shows the data recorded with this logging style. Although it records minimal data, Helix Universal Server still accepts connections from all players, up to its licensed maximum.

> **Note:** If you change the access logging style, the setting applies to all content served through any method.

Offloading Statistics to a Web Server

When players connect to a scalable multicast, Helix Universal Server can instruct them to send their connection statistics to a Web server at the end of the session. Web servers are often configured for load balancing, and may be better equipped than Helix Universal Server to handle large numbers of simultaneous connections that have short durations.

To use a Web server, you will need to write a CGI script that receives the statistics and to writes them to a log file. The statistics sent to the Web server are a subset of those normally recorded in the Helix Universal Server access log. They are transmitted through HTTP `POST`, and they use the following format, in which the `#` symbol is a separator:

`[Stat1:`*`statistics_1`*`][Stat2:`*`statistics_2`*`]#`*`sent_time`*

> **For More Information:** See "Client Statistics" on page 346 for details about client statistics 1 and 2.

Setting Up a Live Channel

The following procedure explains how to set up a live channel for delivering a scalable multicast to RealNetworks media players. You might set up just one live channel for all scalable multicasts. Alternatively, you can create different live channels to multicast broadcast streams in different ways. To run two multicasts at the same time, for example, you define two separate channels.

➤ To create a live channel:

1. In Helix Administrator, click **Broadcast Distribution>Scalable Multicasting**.
2. The **Mount Point** box lists the mount point used for all scalable multicasts. The default mount point is `/scalable/`. RealNetworks recommends that you use this default value, but you may change it if you wish.
3. To create a new live channel, click the "+" icon and enter a descriptive name for this multicast session in the **Edit Channel Description** box.
4. Turn on scalable multicasting for this channel by selecting `Yes` from the **Enable Channel** list.
5. Set the **Enable SAP** list to `Yes` to announce the multicast session, as described in "Publicizing Your Multicasts" on page 159.
6. In the **Path** box, identify the stream name the live broadcast uses. To accept all broadcast streams, keep the default value of an asterisk (*). Otherwise, specify a stream name, such as `live.rm`, and include any virtual path used by the encoder, as in `news/live.rm`. You do not need to include the encoder's unicast mount point, such as `/broadcast/` or `/encoder/`.
7. You next specify the ports and addresses used by the scalable multicast. Refer to "Determining the Number of Addresses and Ports" on page 149 for more information on these topics.
   a. In the **Port Range** boxes, type the port range where clients listen for streams.
   b. In the **IP Address Range** boxes, type the range of addresses to use. Helix Universal Server uses the first available address in this range. To use a single address instead of a range, type the same address in each box.

      Tip: You can use the same range of ports and addresses for multiple channels. If you plan to multicast on multiple channels at the same time, however, ensure that your ranges

are broad enough to cover all of the simultaneous multicasts. Although two channels can share the same range of addresses, for example, they cannot both broadcast on the same address simultaneously.

8. Indicate how far multicast packets can travel on your network in the **Time to Live** box. For information on these values, see "Packet Time to Live" on page 143.
9. Type a value for **Timeout**. This represents the number of seconds a client waits for multicast packets before it stops, or uses the value in **Alternate URL**.
10. From the **Reuse Address** list, select `False` if you want to use a separate address for each stream in a video. Select `True` if you want to use one address for both streams. Refer to "Determining the Number of Addresses and Ports" on page 149 for more information.

    Note: The **Reuse Address** feature works only with RealNetworks media players.

11. You next decide whether to shift media players that cannot receive the multicast to a unicast. This feature works only with RealNetworks media players.
    a. From the **Shift to Unicast** list, select `No` if you do not want to shift clients to unicasting. You may want to choose this when broadcasting a high bit rate presentation in which a lot of unicast streams would consume too much bandwidth. If you choose `No`, you can ignore the next box.
    b. To make the backup unicast available on the same Helix Universal Server, leave the **Alternate Unicast URL** box blank. If you want to shift unicasts to a different Helix Universal Server, supply that server's address and the path to the broadcast. Here is an example:

       `rtsp://helixserver.example2.com/broadcast/vivaldi.rm`

       If you do not want to redirect players to an alternate stream, you can point them to a Web page that posts a message, such as, "This presentation is available only to multicast-enabled RealOne Players." In the **Alternate Unicast URL** box, enter the fully qualified URL of your Web page, such as the following:

       `http://www.example.com/no_multicast.html`

12. The next set of options controls whether client statistics are logged on Helix Universal Server, on a Web server, or not at all. For background on this feature, see "Gathering Client Statistics" on page 150. Only RealNetworks clients report statistics, so you can set this to `No` if multicasting to other RTP-based media players.
    a. In the **Send Client Statistics to Web Server** box, select `Yes` to have clients send their connection statistics to a Web server at the end of the multicast. Select `No` to send connection statistics to Helix Universal Server. If you select `No`, you can ignore the following settings.
    b. In the **Web Server Address or IP Address** box, type the address of the Web server that collects the statistics.
    c. In the **Web Server Port** box, type the HTTP port number of the Web server.
    d. In the **Web Server CGI Path** box, type the path of the CGI script that consolidates the client statistics into a log file on the Web server. For example, enter:

       ```
       cgi-bin/client-stats/logstat
       ```
13. Click **Apply**.

Delivering the Scalable Multicast

Once you've configured the multicast, you launch your broadcast as described in Chapter 7. If you leave scalable multicasting turned on, and configure your multicast to cover all broadcasts by entering "*" as the path, the multicast will be available for all unicasts intended for RealNetworks media players. Unlike back-channel multicasts, however, scalable multicasts use a different URL format than unicasts. This means that the scalable multicast is available only if you provide the proper multicast link.

> **Tip:** If you've enabled the **Shift to Unicast** feature, you can publish just the multicast URL for all broadcasts. Players that can connect through multicasting will do so. Players that cannot use multicasting will use unicasting.

Multicast SDP Files

When Helix Universal Server receives a scalable multicast request, it automatically creates an SDP (Session Description Protocol) file, which is a standard format that contains information such as the multicast addresses

and ports, as well as the broadcast stream's title, author, and copyright information.

The media player receives the SDP file when the viewer clicks the multicast link in a Web page, and connects to the multicast using the file's information. A viewer can also download the SDP file, typically by right-clicking on the Web page link, then connect to the multicast later by opening the file directly in the media player.

Linking to a Scalable Multicast

Scalable multicast links differ from unicast links. They use the same format whether they appear in a Web page or in a metafile, and they always specify the HTTP protocol. The requested stream always ends with the `.sdp` extension. The following illustrates the link format:

http://*address:port/mount_point/path/file.rm*.sdp

Here is an example in which Helix Universal Server uses its default port 80 for HTTP, so the port number is not listed:

```
http://helixserver.example.com/scalable/news/live.rm.sdp
```

- The default mount point is `/scalable/`, but you can change this as described in "Setting Up a Live Channel" on page 152. The `/ramgen/` parameter is not required, even though HTTP is used.
- A virtual path name such as `news/` is optional. You include it only if the encoder specifies this path when it delivers the stream.
- The requested file includes the stream name specified for the broadcast by the encoder, such as `live.rm`. You then append an extra `.sdp` extension. Even though MPEG unicasts link to an SDP file, as in `live_mp4.sdp`, the multicast requires an extra `.sdp` extension in the request URL, as in `live_mp4.sdp.sdp`.

> **Tip:** The SDP file contains exact channel settings. If you plan to repeat a multicast, and you want users to connect through a saved SDP file, use the same encoder settings, addresses, and ports as in the preceding multicast.

> **Note:** For players to receive the broadcast and log statistics, `/scalable` must be in the HTTP delivery list, which is described in "Allowing HTTP Delivery" on page 65. Enabling scalable multicasts adds this mount point to the list automatically.

Multicasting Windows Media

As with all Windows Media broadcasts, a Windows Media multicast is pulled from a Windows Media encoder the first time a Windows Media Player requests the multicast. You need only one IP address and port for each multicast. This style of multicasting builds on the basic unicasting definitions you set up according to instructions in "Broadcasting Windows Media" on page 130.

Defining a Multicast Channel

To set up Windows Media multicasts, you first define one or more multicast channels. A multicast can go out on a channel as long as the channel is enabled.

➤ To create a Windows Media multicast channel:

1. In Helix Administrator, click **Broadcast Distribution>Windows Media Multicasting**.
2. The **NSCFilePath** box lists the path to the NSC file, which Windows Media Players use to connect to multicasts. The default path is the `nscfile` directory under the `Content` directory, but you can change this to another directory that holds on-demand content. Helix Universal Server automatically generates the NSC file in the specified directory, using the channel name as the file name and `.nsc` as the extension.

   Note: If you use a different directory for the NSC file, add that path to the HTTP delivery list, as described in "Allowing HTTP Delivery" on page 65.

3. To create a new live channel, click the "+" icon in the **Channels** section and enter a descriptive name for this multicast session in the **Channel Name** box. Because the channel name becomes the NSC file name, RealNetworks recommends that you do not include spaces or special characters in the name.
4. Enable multicasting for this channel by selecting `Yes` from the **Enable Broadcast** list. After the multicast, you can disable the channel by resetting this list to the default value `No`.

> **Tip:** Because Windows Media multicasts are pulled on request, and viewers can save the NSC file locally, it's a good idea to disable a channel when you do not intend to use it.

5. In the **Multicast Address** box, type the class D multicast address to use. You need only one address for each multicast. Each channel must use a different address.
6. In the **Port Range** boxes, type the port where clients should listen for streams on this channel. Each channel must use a different port.
7. Indicate how far multicast packets can travel on your network in the **Time to Live** box. For information on these values, see "Packet Time to Live" on page 143.
8. In the **Stream Description** box, you can type any text that describes this multicast stream. This is for your reference, and is not used in the multicast.
9. To make a backup unicast available for media players that cannot join the multicast, supply the address and path to the unicast in the **Alternate Unicast URL** box. Although the unicast can be on the same Helix Universal Server, you need to define the address explicitly for the unicast failover to work. Here is an example:

   ```
   mms://helixserver.example.com/wmtencoder/chopin.wma
   ```

10. For **Client Statistics URL**, supply an HTTP address or host name for the Microsoft Internet Information Server (IIS) that gathers client statistics at the end of the multicast. If you leave this field blank, media players do not send back any statistics. Players cannot send statistics to Helix Universal Server.

    > **For More Information:** Refer to the Windows Media Services documentation on reporting multicast statistics for instructions about setting up IIS to gather statistics.

11. Proceed to the next section if you want to define the live sources that use this multicast channel. You can click **Apply** to save the channel definition, however, if you want to set up its channel sources later.

Setting Up a Live Source

Each channel can multicast a live stream from any number of Windows Media encoders. However, it can multicast a stream from just one of its live sources at a time. Below a channel definition, you set up the live sources that each channel can use. Each channel maintains a separate list of sources.

➤ **To set up a live source for a channel:**

1. In Helix Administrator, click **Broadcast Distribution>Windows Media Multicasting**.
2. In the **Channels** box at the top of the page, highlight the channel for which you want to create a live source.
3. Scroll to the bottom of the page and click the "+" icon in the **Channel Sources** section to set up a new live source.
4. Enter a descriptive name for this source in the **Channel Source Name** box. This name is for your reference only, and is not used in the multicast.
5. For **Stream Format File**, enter the full path and file name of the ASF file (extension `.asf`) that Windows Media Encoder generates and is copied to Helix Universal Server when the encoding begins. This file is used only by Helix Universal Server, and is not delivered to media players.

   Tip: Because ASF is a streaming format, RealNetworks recommends that you do not place the format file in a directory used for on-demand streaming. This helps you to avoid mistaking the format file for a streaming clip.

6. For **Live Source**, specify the mount point and stream name that identifies the live stream pulled from Windows Media Encoder. These elements are defined in the Windows Media unicast page, described in "Broadcasting Windows Media" on page 130. The default mount point is `/wmtencoder/`, so a **Live Source** entry might look like this:

   ```
   /wmtencoder/live.wmv
   ```

   Warning! You must define a specific broadcast stream for each live source. Windows Media multicasting does not support the use of a wildcard character (such as "`*`") to pull all broadcasts that use the `/wmtencoder/` mount point.

7. Click **Apply** to save the live source definition.

Running the Windows Media Multicast

Once you've enabled the multicast and defined the live source, you are ready to begin the multicast. Start Windows Media encoder running, and deliver the ASF stream format file to the predefined location on Helix Universal Server. The broadcast starts with the first media player request.

Linking to the Multicast

Windows Media Players join the broadcast by requesting a download of the NSC file, which then instructs them on how to join the multicast. You can launch the broadcast through an HTTP link in a Web page, as shown in the following example. The `/asxgen/` mount point normally required to launch Windows Media Player is not required:

```
http://helixserver.example.com/nscfile/live_channel.nsc
```

> **Tip:** If you're using the unicast failover option, you can publish just the NSC file URL. Players that can connect through multicasting will do so. Players that cannot use multicasting will switch to the unicast URL.

Stopping a Windows Media Multicast

As a channel multicasts the stream, the channel name appears in the **Transmitting Channels** box at the top of the multicasting set-up page. To stop the broadcast, highlight the channel name, check the **Stop Transmitting** box, and click **Apply**. This changes the **Enable Channel** list to `No` to prevent the stream from being pulled again. To restart the channel, select `Yes` in the **Enable Channel** list and click **Apply**.

Publicizing Your Multicasts

Optionally, you can publicize back-channel and scalable multicasts to anyone running a program that listens for the Session Announcement Protocol (SAP). These applications, such as SDR and ICAST Guide, display a list of all multicasts currently playing. Helix Universal Server creates the SAP file automatically. Programs that listen for SAP announcements show the title, author, and copyright information encoded into the files you multicast.

> **Note:** The Windows Media multicast format does not support Session Announcement Protocol.

➤ To set up Helix Universal Server to create SAP files:

1. In Helix Administrator, click **Broadcast Distribution>Session Announcement**.
2. In the **Host IP Address** box, type the IP address of this Helix Universal Server. The SAP announcement will include this address.
3. From the **Enable SAP Service** pull-down list, select `Yes`. This instructs Helix Universal Server to create and send SAP files. The default value is `No`.
4. From the **Listen to SAP** list, ensure that the default value of `Yes` is selected. This option enables Helix Universal Server to collect in-use multicast addresses. Helix Universal Server consults this list when selecting a multicast address from the user-supplied address range, thus ensuring that it selects unique addresses that are not in use elsewhere on your network.
5. Click **Apply**.

CHAPTER

9

TRANSMITTERS AND RECEIVERS

Transmitters and receivers are two components of *splitting*, which enables you to deliver broadcast streams in any format to multiple Helix Universal Servers. The servers then unicast or multicast the stream to media players. This chapter describes different splitting arrangements, then explains how to set up Helix Universal Server as a transmitter, a receiver, or both.

Understanding Splitting

At its most basic level, splitting is a technology that enables one component to deliver a live or simulated live broadcast stream to another component. This allows an encoder to transmit a stream to one or more servers, for example, and a server to distribute a stream to one more additional servers. You can thereby deliver single broadcasts to many more users than you could with a single Helix Universal Server. As a result, splitting fosters higher-quality broadcasts by distributing broadcast streams closer to viewers.

Note: Splitting builds on the foundation of unicasting described in Chapter 7. Before you configure a splitting arrangement, be sure that you understand the concepts and procedures described in that chapter.

Tip: The section "SLTA Quick Start Tutorials" on page 196 introduces you to transmitters and receivers by explaining how to simulate a live broadcast on your Helix Universal Server.

Definitions

Because splitting technology has many uses and components, it is important to understand the following general terms.

Encoder
An encoder is software that generates a live or simulated live stream. For RealMedia, an encoder can be Helix Producer or the simulated live transfer agent (SLTA). Additional encoders that you can use include Windows Media Encoder and Sorenson Broadcaster.

Transmitter
A transmitter is a Helix Universal Server on which a stream originates. The transmitter sends the stream to a receiver, and can also broadcast the stream directly to media players. Helix Producer and SLTA can also function as transmitters. They send a stream only to a Helix Universal Server receiver, however, and not to individual media players.

Receiver
A receiver is a Helix Universal Server that receives a stream from a transmitter and broadcasts it to media players.

Relay
A relay is a Helix Universal Server that functions as both a receiver and a transmitter. It receives a stream from another source, and transmits that stream to another receiver. It may also broadcast the stream directly to media players.

Push Splitting
In push splitting, a transmitter initiates the splitting session by delivering the broadcast stream to one or more receivers.

Pull Splitting
In pull splitting, a receiver initiates the splitting session by contacting a transmitter and requesting the stream.

Encoder-to-Server Splitting

You can use splitting technology to deliver a live or simulated live broadcast stream from an encoder to Helix Universal Server. Although this arrangement involves splitting, it does not necessarily involve multiple Helix Universal Servers. Helix Universal Server can acquire a stream in many ways, not all of which use splitting. The following table explains the various methods of

encoder-to-server delivery, indicating whether each method is based on splitting technology.

Splitting Used in Server Stream Acquisition

Stream Delivery Method	Split?	Notes
Live stream using Helix Producer push or pull mode.	**yes**	The push and pull modes in Helix Producer both involve splitting, in which Helix Producer is the transmitter and Helix Universal Server is the receiver.
Simulated live stream using SLTA.	**yes**	In its advanced mode, SLTA, which Chapter 10 covers, functions as a transmitter, and Helix Universal Server acts as a receiver.
Live stream using Helix Producer in account-based mode.	no	Although account-based mode is a subset of push mode, it does not use splitting. Instead, it uses the stream delivery technology of earlier versions of RealProducer. To broadcast in this mode, follow the instructions in "Setting Up Account-Based Broadcasting" on page 126. You do not need to set up Helix Universal Server as a receiver.
Live stream using RealProducer G2 through 8.5.	no	Earlier versions of RealProducer do not use splitting technology. The section "Encoding with an Older Version of RealProducer" on page 128 explains how to use them to deliver a stream to Helix Universal Server. You do not need to set up Helix Universal Server as a receiver.
Live or simulated live stream using any other media encoder.	no	Only RealNetworks encoders use splitting technology. Encoders for other media formats, such as Windows Media and QuickTime, deliver streams to Helix Universal Server by other means. See Chapter 7 for more information. You do not need to set up Helix Universal Server as a receiver.

No matter how Helix Universal Server acquires a broadcast stream, it can use splitting technology to transmit that stream to other Helix Universal Servers. Keep in mind, therefore, that encoder-to-server and server-to-server splitting are different functions, and one does not require the other. This enables you to split Windows Media and QuickTime broadcasts, for example, even though the encoders are not based on RealNetworks splitting technology.

Server-to-Server Splitting

In server-to-server splitting, a Helix Universal Server transmits a live or simulated live stream to another Helix Universal Server. The transmitter may have acquired the stream through a splitting set-up with a RealNetworks encoder, or through a conventional broadcast method. This allows you to distribute the same stream to multiple Helix Universal Servers across your network. You can use splitting technology to tie together a cluster of Helix Universal Servers on an intranet, as well as to connect different servers around the globe over the Internet.

Splitting offers many features that help you to tie together large networks of Helix Universal Servers, conserve bandwidth, and transmit different streams to different receivers. The following are the major features of server-to-server splitting, which subsequent sections explain in detail:

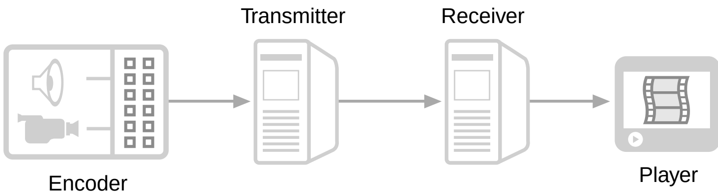
- **push and pull splitting**—A splitting configuration can use push splitting, pull splitting, or both.
- **unicasting and multicasting**—Transmitters can unicast or multicast to receivers. You can also combine methods to unicast a stream across the Internet, then split it by multicasting behind a firewall.
- **single transmitters or chained relays**—One transmitter can split a stream to multiple receivers. Or, each Helix Universal Server can relay the stream to the next Helix Universal Server. You can combine these methods to tie together a large network of servers in any configuration.
- **SureStream-aware splitting**—When you broadcast RealMedia, SureStream-aware splitting saves bandwidth by sending only the encoded streams that have been requested.
- **multiple splitting definitions**—You don't have to split each broadcast the same way. Each Helix Universal Server can have multiple transmitter and receiver definitions. This lets you push certain broadcasts, for example, and pull others. Streams can originate anywhere on your network.
- **redundancy**—Splitting fully supports encoder redundancy for any media type. In addition, it lets you add server and stream redundancy.

Push Splitting

The following illustration shows the conventional, or "push" form of server-to-server splitting. Here, the transmitter initiates the connection to the

receiver. When a media player requests the broadcast, the receiver is ready to deliver the stream. In this form of splitting, Web page links typically point to the receiver. A transmitter can also deliver streams to media players, however.

Push Splitting



Pull Encoding with Push Splitting

In push splitting, the encoder typically pushes the broadcast stream to the transmitter, initiating the broadcast. However, the transmitter can pull the stream from the encoder, too. This lets you use push splitting with the pull-only encoding methods of Windows Media and QuickTime. To do this, you might create a private link to the broadcast on the transmitter. When you're ready to push the stream to the receiver, you click this link, which causes the transmitter to pull the stream from the encoder, and push it to the receiver. Viewers can then connect to the broadcast on the receiver.

Push Splitting Configuration

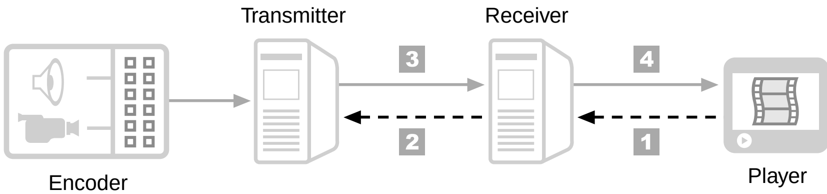
You do the following to configure push splitting:

- Set up the originating Helix Universal Server as a push transmitter as described in "Configuring a Pull Splitting Transmitter" on page 183. Ignore the pull-splitting configuration fields.
- Define one or more Helix Universal Servers as receivers as described in "Setting Up a Receiver" on page 185. Ignore the pull-splitting configuration fields.
- Set up your encoder to deliver the broadcast stream as appropriate for that encoder. With Helix Producer, you can use push or pull delivery, though push is more appropriate for this arrangement as it allows you to start the entire broadcast directly from the encoder.
- Create links to the broadcast as described in "Linking to Split Content" on page 187.

Pull Splitting

The following illustration shows pull splitting, in which the transmitter does not deliver the stream to the receiver until the first media player makes a request (step 1). There's a slight delay as the receiver requests (step 2), receives (step 3), and delivers (step 4) the stream. After that, the stream is live on the receiver, and subsequent player requests do not involve the session setup delay of step 2.

Pull Splitting



For More Information: For details about delays caused by pull splitting, see "Stream Acquisition Latency" on page 176.

Pull Splitting Bandwidth Efficiency

Although pull splitting results in greater latency than push splitting on the first broadcast request, it can save on bandwidth because the stream is not transmitted to the receiver if no media player requests the stream. As well, if all media players disconnect from the receiver before the broadcast ends, the data stream between transmitter and receiver is dropped. Hence, pull splitting never consumes bandwidth between transmitter and receiver if no one is viewing the broadcast on that receiver.

Tip: You can combine push and pull splitting for optimal results. Suppose that you are delivering a broadcast across many different time zones. You could push the stream to receivers that reside in daytime zones. Where it's late at night and there are fewer potential viewers, you could have receivers pull the stream only on viewer request.

Push Encoding with Pull Splitting

If you set up pull splitting between transmitters and receivers, you can still use Helix Producer or SLTA to push the stream to the transmitter. This cues the

broadcast so that the transmitter can respond faster to pull splitting requests from receivers.

Pull Splitting Configuration

You do the following to configure pull splitting:

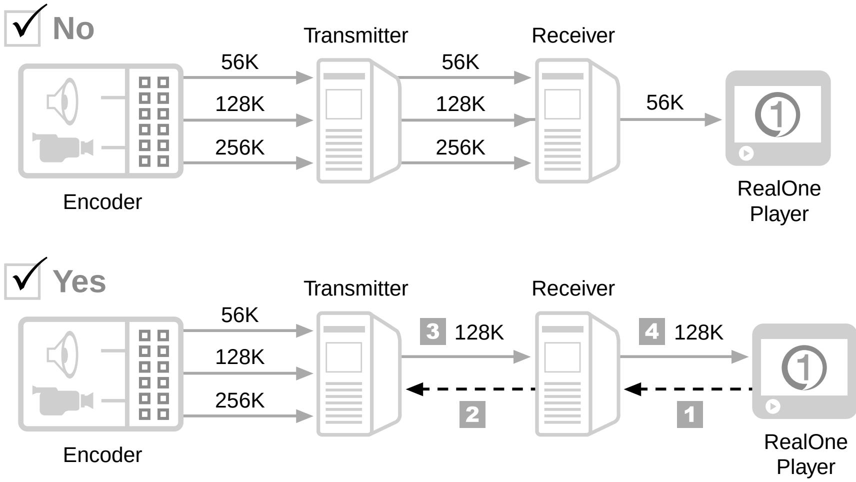
- Set up the originating Helix Universal Server as a transmitter as described in "Configuring a Pull Splitting Transmitter" on page 183.
- Define one or more Helix Universal Servers as receivers as described in "Setting Up a Receiver" on page 185. Enable the receiver for pull-splitting.
- Set up your encoder to deliver the broadcast stream as appropriate for that encoder. With Helix Producer, you can use push or pull delivery.
- Create links to the broadcast as described in "Linking to Split Content" on page 187.

SureStream-Aware Splitting

SureStream-aware splitting is similar to pull splitting when you broadcast RealMedia streams encoded at different bit rates. Without SureStream-aware splitting, the transmitter sends all streams encoded in the broadcast to the receiver. In the following illustration, the top portion illustrates a broadcast that is not SureStream-aware. The broadcast itself may be either push or pull. When the receiver acquires the broadcast stream, it gets all of the SureStream bit rates, even if only the 56 Kbps stream has been requested by media players.

In contrast, SureStream-aware splitting sends each stream only on request. The bottom half of the following illustration shows a player requesting the 128 Kbps stream. Even though the encoder sends the transmitter all the streams, only the 128 Kbps stream goes to the receiver. If another media player later requests the 56 Kbps stream, the transmitter forwards that stream, too. If a certain stream is never requested, it is never sent to the receiver. As well, the transmitter drops a stream if media players stop using it during the broadcast.

SureStream-Aware Splitting Enabled from Transmitter to Receiver



SureStream-aware splitting works with both push splitting and pull splitting arrangements. Even if your entire network is set up for push splitting, receivers are sent individual SureStream streams only on request. Like pull splitting, SureStream-aware splitting helps to conserve bandwidth during broadcasts, but is not available when transmitters and receivers communicate through multicasting.

> **Tip:** To archive a SureStream-aware broadcast, set up your archive on the Helix Universal Server connected to the encoder. This is the only server guaranteed to receive all SureStream streams. For more on archiving, see "Archiving Broadcasts" on page 117.

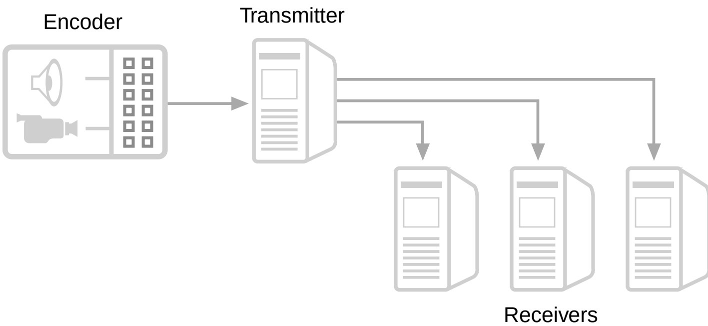
Complex Splitting Arrangements

You can combine the basic splitting methods (push and pull) with the two transport methods (unicast and multicast) in many ways. Splitting also supports encoder redundancy, and can add failover protection for streams and transmitters. The following sections describe different splitting setups, their benefits, and drawbacks. Keep in mind that you can create different splitting arrangements throughout different parts of the network to achieve your goals, whether that's to maximize bandwidth efficiency, or to reduce broadcast latency.

One-to-Many Splitting

A common splitting arrangement uses a single transmitter to broadcast to multiple receivers. If you do this through unicasting, each receiver gets a unique stream, so bandwidth consumption increases with each receiver. Multicasting uses less bandwidth, and is a better solution if all components are on a multicast-enabled network. The following illustrations shows unicasting through push splitting, though you can also use pull splitting, in which each receiver connects to the transmitter only when it needs the stream. Server-to-server multicasting is not available with pull splitting, however.

One-to-Many Splitting

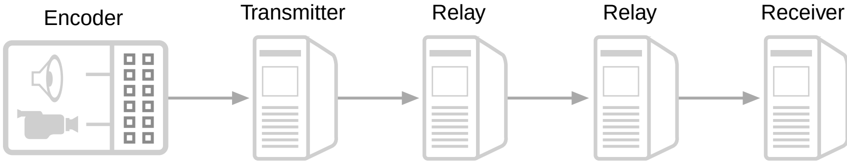


Because both Helix Producer and SLTA use splitting technology, they can function as transmitters connecting to multiple Helix Universal Server receivers. A Helix Universal Server is therefore not required to be the transmitter. For a live broadcast, though, you may not want to use Helix Producer to transmit the stream to many receivers. Real-time encoding of a live event uses a lot of processor power, and it's better not to burden the encoder with stream management overhead as well. This is not an issue in a simulated live broadcast using SLTA, however, because the streams are already encoded.

One-to-One Chaining

Another option is to use one-to-one chaining, in which each receiver transmits to another receiver. Receivers in the middle of the chain thereby function as relays. This option is viable if a group of servers is spread across a wide area, and uses unicasting over the Internet to communicate. A transmitter in San Francisco might push a stream to a Tokyo receiver, which pushes it to a Sydney receiver, and so on.

One-to-One Chaining

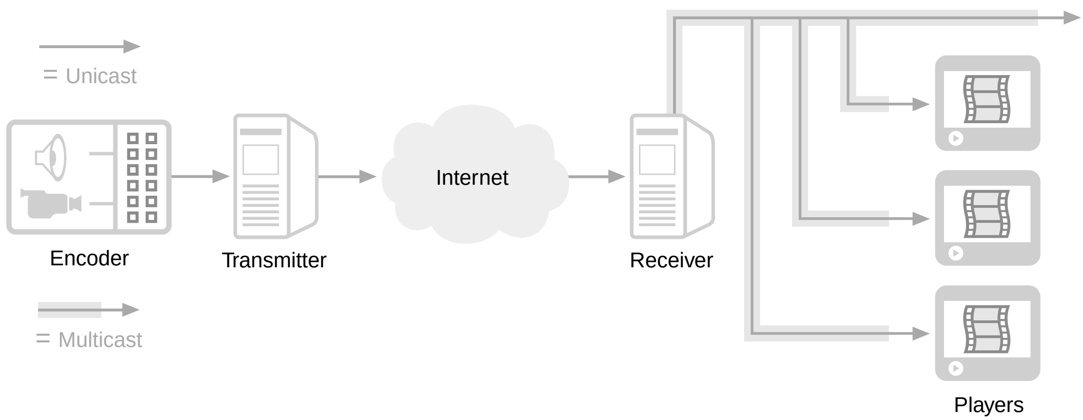


Although you can use pull splitting with a relay chain, push splitting suits this setup better. With pull splitting, there may be a long latency period if the first broadcast request comes from far down the chain. In this case, the request has to make its way back the chain, causing each receiver in the chain to pull the stream from the preceding transmitter. As well, pull splitting links for a relay chain quickly become very long, increasing your chances of writing incorrect URLs to the broadcast. Using URL aliases, though, eases this burden.

Unicast Delivery, Multicast Distribution

Splitting works with multicast delivery, as well as unicasting. You can unicast streams to receivers across the Internet, an intranet, a wide area network, or a local area network, for example. Then, within an intranet, you can multicast the stream from the receivers to media players. The following illustration shows this type of delivery.

Unicast Delivery, Multicast Distribution

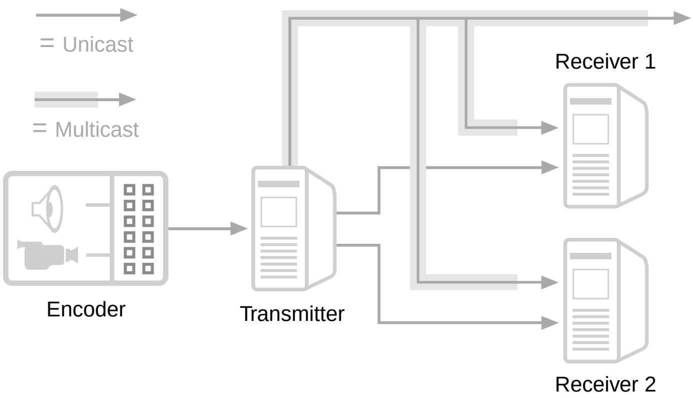


Dual Unicast and Multicast Transport Methods

If your server network is multicast-enabled, you can simultaneously unicast and multicast a broadcast stream to receivers. Duplicate packets arriving by

different transport methods increase the network overhead, but do not cause problems for receivers. When a receiver reassembles the broadcast stream, it uses the packets that arrive first, regardless of their transport methods. If a unicast packet is late or missing, for example, the receiver may get the right packet through multicast. The following figure illustrates this dual delivery.

Broadcasting by Multiple Methods

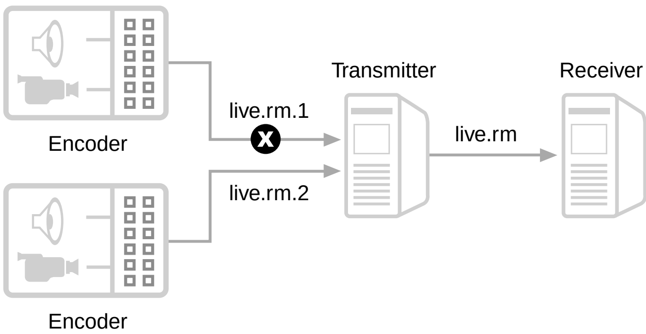


Tip: Server-to-server multicasting requires a multicast-enabled network just like server-to-player multicasting. However, you do not configure server-to-server multicasts as described in Chapter 8. You simply select multicast as your transport method when configuring transmitters and receivers.

Redundant Stream Splitting

As explained in "Using Broadcast Redundancy" on page 122, Helix Universal Server supports encoder redundancy for all media formats. This redundancy carries over automatically with splitting, requiring no special configuration for transmitters and receivers. As shown in the following illustration, separate encoders deliver the same stream (delimited with an integer, as in `live.rm.1` and `live.rm.2`) to the transmitter. If the primary stream files, the transmitter uses the backup stream. It sends the receiver one stream, which may come from either the primary or the backup encoder.

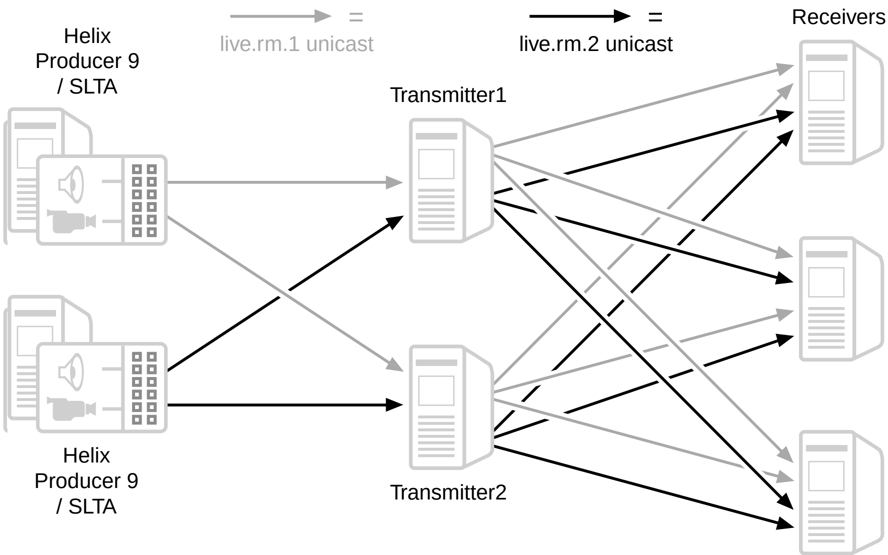
Simple Redundant Source for Splitting



Transmitter Redundancy

The setup in the preceding illustration provides a single level of encoder redundancy. You can increase redundancy within a splitting arrangement by adding transmitter redundancy, as shown in the following illustration. Here, both the primary and backup encoders send streams to two Helix Universal Servers that each split the stream to three receivers. (Both SLTA and Helix Producer can push the same stream to multiple Helix Universal Servers.) Under normal conditions, each receiver gets a version of `live.rm` from each transmitter.

Redundant Sources and Redundant Transmitters

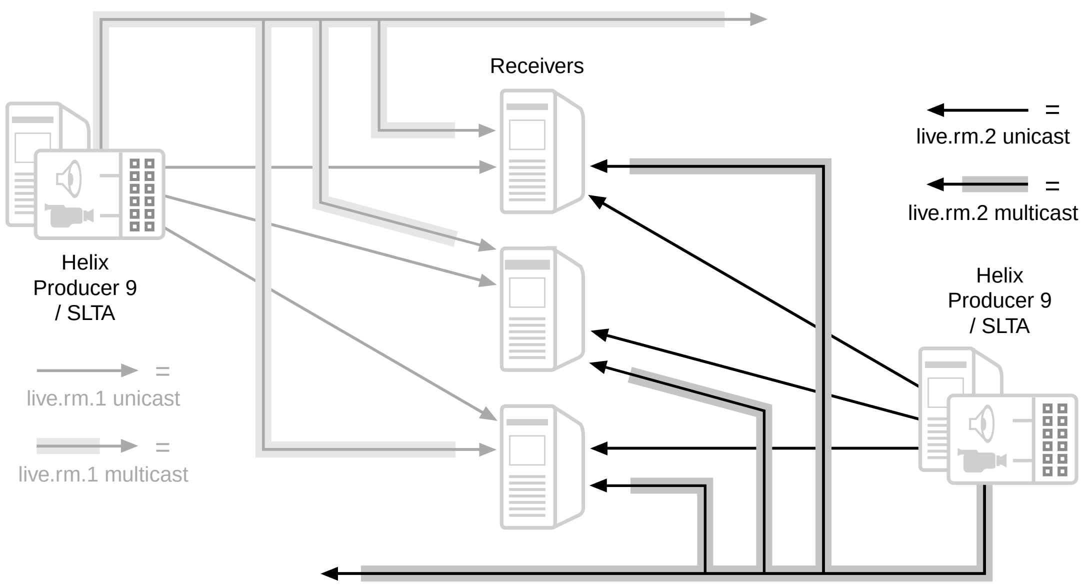


If the primary encoder in the preceding illustration fails, both transmitters switch to the stream from the backup encoder. Again, the receivers get two streams, one from each transmitter. Note that in this configuration, each receiver still receives a stream even if one encoder *and* one transmitter fail. This provides both encoder and transmitter redundancy. Three out of the four encoder and transmitter components would have to fail for the entire broadcast to fail.

Transport Redundancy

The following illustration shows multiple encoders and delivery methods used to provide encoder and transport redundancy. The primary and backup encoders both unicast a separate stream to each receiver, as well as multicast the broadcast stream to all receivers. Each receiver gets four streams. It uses the primary `live.rm.1` stream as long as those packets arrive by either unicast or multicast. If the primary encoder fails, or its transport methods are blocked, each receiver switches to the `live.rm.2` backup sent over unicast or multicast.

Redundant Encoders Using Unicasting and Multicasting



Note that the receivers in the preceding illustration could also function as transmitters that split streams to other receivers, as described in "Transmitter Redundancy" on page 172. This would provide three layers of redundancy at the encoder, transmitter, and transport levels. Although such a complex

arrangement and high degree of redundancy is generally not necessary, RealNetworks components provide support for all of these layers, which you can put together as needed.

Multiple Splitting Definitions

You may set up your transmitters and receivers to split every broadcast the same way. In this case, you always use a certain Helix Universal Server as your primary transmitter, and your other Helix Universal Servers as receivers or relays. This is not necessary, however, and a single network of Helix Universal Servers can support numerous splitting arrangements, enabling you to transmit from any Helix Universal Server. As well, you can split broadcasts from a single transmitter in many different ways.

When you set up splitting, you can create multiple transmitter and receiver definitions on each Helix Universal Server. When you set up a push transmitter, for example, you define how it connects to each receiver. For a single Helix Universal Server receiver on one physical machine, you can create multiple receiver definitions. RealMedia broadcasts can use one definition, for example, while Windows Media broadcasts use another. This lets you multicast one format, for instance, while unicasting another.

You can also use multiple receiver definitions to split broadcasts in different ways according to stream source names, which appear in links to broadcasts. A source name has three parts:

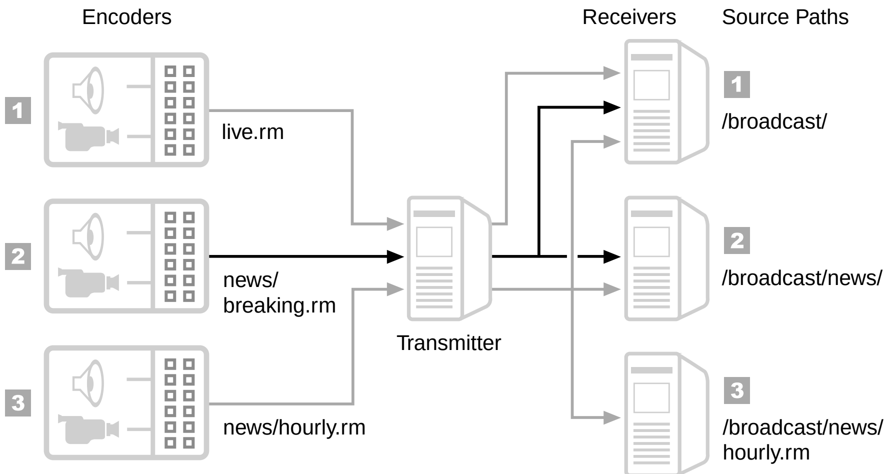
1. **mount point**—As explained in Chapter 7, every broadcast uses a mount point. Broadcasts pushed by Helix Producer use the `/broadcast/` mount point, for example, while Windows Media broadcasts use `/wmtencoder/`.
2. **path**—The optional path name does not necessarily correspond to an actual path. It's generally a name inserted between the mount point and the stream name to provide splitting functionality. How you define the path differs for each media format:
   - For RealMedia broadcasts, you define the path name through Helix Producer.
   - For Windows Media broadcasts, you define the path when configuring the encoder pull session on Helix Universal Server, as described in "Broadcasting Windows Media" on page 130.

- For QuickTime and RTP-based broadcasts, the path name reflects the subdirectory where the encoder placed the SDP file. For more information, see "Starting the RTP-Based Broadcast" on page 134.

3. **stream name**—In all broadcasts, the stream name appears last in the URL and looks like an on-demand clip name, ending with the media format's standard file extension.

The following illustration shows how you can use mount points, paths, and stream names within receiver definitions to split different broadcasts in different ways. Three encoders connect to the same transmitter and deliver three separate streams. The first stream, `live.rm`, uses no path. The second and third streams, `news/breaking.rm` and `news/hourly.rm`, use the same path name, but different stream names.

Stream Direction through Mount Points, Paths, and File Names



Each receiver in the preceding illustration is defined with a different broadcast source path. (The definitions are actually created on the transmitter, which is responsible for directing the streams.) The first receiver accepts all broadcasts that use the Helix Producer default broadcast mount point, `/broadcast/`. In this example, it receives all three broadcast streams because specifying just the mount point is the widest source criterion.

The second receiver gets all broadcasts that use the `/broadcast/news/` mount point and path. It therefore receives streams 2 and 3, but not stream 1, which does not use the `news/` path. The third receiver uses the most specific criteria.

It receives only the broadcast streams that use the `/broadcast/news/hourly.rm` mount point, path, and stream name.

Splitting Considerations

This section provides general information you'll find useful when setting up any splitting arrangement. When you use pull splitting, you need to consider the latency involved in acquiring a stream. When unicasting multiple streams, bandwidth is an issue because each receiver gets a separate broadcast stream.

Stream Acquisition Latency

Receiver latency occurs in pull splitting when the first media player requests the broadcast. On the first request, the receiver pulls the stream, but must wait for session announcement information to arrive from the transmitter. To determine how long a receiver takes to acquire a live split stream, you need to consider the following:

- The degree of normal network latency that exists between the transmitter and receiver.
- The configurable interval used to send session descriptions, which is defined on the transmitter in push splitting, and on the receiver in pull splitting.

A receiver does not start to process incoming data until it receives the session description from the transmitter. If the transmitter's session metadata rate is set to 30 seconds, for example, the receiver needs to wait up to 30 seconds to get the session description and begin to process broadcast packets. This time delay does not include any network latency that may exist between the transmitter and the receiver.

As soon as the live distribution stream arrives at the receiver, the receiver constructs a local buffer before streaming data to the connected media players. To help minimize latency, a receiver that uses pull splitting builds only a 1-second buffer before sending the stream to the media player that initiated the pull splitting session.

> **Note:** With SureStream-aware splitting, session description information is sent to receivers even when no players are connected. Because the receiver does not have to wait for the

next session description, latency is not an issue even though SureStream-aware splitting functions like pull splitting.

Bandwidth Consumption

Calculating the bandwidth used by a broadcast depends on whether the broadcast is single-rate stream, or a multi-rate format like SureStream. Single-rate broadcasts consume bandwidth according to the following criteria:

- The encoded bit rate of the live stream.
- The percentage of overhead (approximately 10 percent) for session announcement information and TCP/IP headers.
- The percentage of overhead for the configurable error correction rate.

For example, a single-rate 100-Kbps stream with an error correction rate set to 10 percent (10 Kbps) will need approximately 10 Kbps of overhead, for a total bandwidth of approximately 120 Kbps.

The bandwidth consumed by a SureStream broadcast equals the combined bit rates of all the audiences, plus the overhead percentages described previously. If SureStream-aware splitting has been enabled, bandwidth use is determined by the actual number of bit rates requested by media players, however. Your calculation will give you a maximum, but not all streams may be requested during the broadcast.

Error Correction and Receiver Buffering

When you use push or pull splitting, setting a low forward error correction rate (FEC) may cause error correction packets to arrive after the receiver has transmitted the contents of its data buffer to its connected clients. When this happens, the error correction packets are useless. This problem is most likely to occur with low-bandwidth RealVideo streams when your splitting arrangement uses an error correction rate lower than the default value of 20.

Recommended Receiver Buffering Times for RealVideo

To ensure that error correction packets reach the receiver before it streams its buffer to clients, you can increase the time that the receiver buffers data. The following table provides some minimum receiver buffering times when splitting RealVideo streams. For example, if you split a 34 Kbps RealVideo stream using an error correction rate of 5, set a receiver buffering time of at

least six seconds. The default receiver buffering time for push or pull splitting is one second.

Minimum Receiver Buffering Times for RealVideo

Speed	FEC=20	FEC=15	FEC=10	FEC=5	FEC=1
34 Kbps	2 seconds	2 seconds	3 seconds	6 seconds	30 seconds
80 Kbps	1 second	1 second	2 seconds	3 seconds	13 seconds
150 Kbps	1 second	1 second	2 second	3 seconds	11 seconds
225 Kbps	1 second	1 second	1 second	2 seconds	8 seconds
350 Kbps	1 second	1 second	1 second	2 seconds	7 seconds
450 Kbps	1 second	1 second	1 second	1 second	5 seconds

Note the following about these recommended buffering times:

- The preceding values are for RealVideo only. Other video formats may have different packet sizes, and hence may require different receiver buffering times.
- Because the default buffering value for push and pull splitting is one second, it is not necessary to modify your configuration file unless you need to set a higher value.
- Audio packets are much smaller than video packets, so when you stream audio-only clips, you generally do not need to increase the buffering time on the receiver when using a low error correction rate.
- The buffering times given in the preceding table are minimum values. You can always set a higher buffering time. However, higher buffering times may delay initial playback unnecessarily when a media player requests a stream.
- For push splitting, you set the error correction rate on the transmitter, as described in "Defining a Push Transmitter" on page 180. For pull splitting, you set the rate on the receiver as described in "Enabling Pull Splitting Requests" on page 186. You set the receiver buffering time manually through the receiver configuration file.

Setting Receiver Buffering Variables

To make the receiver buffer the split stream longer than one second, edit the receiver's configuration file with any text editor. You need to add one or two variables depending on whether you use push splitting, pull splitting, or both.

The variables are not predefined, and you add them within the Receivers list, which falls under the BroadcastReceivers list.

For push splitting, add <Var PushBufferingTime="*seconds*"> to the list. For pull splitting, add <Var PullBufferingTime="*seconds*">. Each variable's value is an integer that specifies the number of seconds of buffering. It is easiest to add one or both variables below the error correction variable. For example:

```
<Var FECLevel="10"/>
<Var PushBufferingTime="2">
<Var PullBufferingTime="3">
```

Note: Although you set the buffering times for both push and pull splitting within the receiver list, the FECLevel variable in this list sets the forward error correction only for pull splitting. For push splitting, the error correction rate is set through the FECLevel variable in the transmitter list on the Helix Universal Server used as the transmitter.

For More Information: See Appendix A for information about the configuration file. For information about configuration variables, see *Helix Universal Server Configuration File Reference* at **http://www.realnetworks.com/resources/contentdelivery/server/config_variables.html**

Other Features Used with Splitting

This following table describes the ways in which splitting works with other features.

Splitting Used with Other Features

Feature	Notes
SLTA	SLTA transmits prerecorded clips as simulated live broadcasts. Using it is a good way to test your receiver configurations before you broadcast a live event
Live Archiving	Both transmitters and receivers can archive live RealMedia streams. With SureStream-aware splitting, archive on the transmitter connected to Helix Producer to ensure that all streams are archived.
Multicasting	A multicast transmission between receivers and media players, as described in "Unicast Delivery, Multicast Distribution" on page 170, makes the most effective use of bandwidth.

(Table Page 1 of 2)

Splitting Used with Other Features (continued)

Feature	Notes
Helix Universal Proxy	Because live events are not files, Helix Universal Proxy cannot cache broadcasts. Instead, Helix Universal Proxy replicates live streams among media players through pull splitting.
Firewalls	In their default configuration, the transmitter and the receiver use UDP for fast, efficient distribution. Some firewalls may block UDP traffic, however. For more information, see "Communicating With Receivers" on page 234.
Access Control	If you use the access control feature to block access to your transmitter, receivers can still receive push broadcasts, but transmitters cannot honor a receiver's resend requests. Pull splitting receivers will not receive any content at all.
Authentication	When splitting a broadcast that requires viewer validation, place copies of all databases that store authentication information on receivers to distribute the authentication load.

(Table Page 2 of 2)

Setting Up a Transmitter

The following sections explain how to configure Helix Universal Server as a push or a pull transmitter. Although the same Helix Universal Server can function as a push or a pull transmitter in different cases, you define each transmitter instance separately. That is, the push transmitter settings do not require you to set anything in the pull settings area, and vice versa.

If your Helix Universal Server is receiving a broadcast stream from Helix Producer or SLTA, you set it up as a receiver, not a transmitter. Here, Helix Producer or SLTA is the transmitter, which you set up as described in *Helix Producer's User's Guide* or Chapter 10, respectively. In these cases, you need to define Helix Universal Server as a transmitter only if it forwards the broadcast stream to other Helix Universal Server receivers.

Defining a Push Transmitter

You create a separate push transmitter definition for each receiver that your Helix Universal Server transmits to. To broadcast to multiple receivers at the same time, you define multiple transmitter instances that all use the same broadcast source path. Alternatively, you can set up receivers to receive only certain broadcasts. This lets you create a large list of receivers that are sent broadcast streams only when those streams include certain path criteria.

➤ To define a push transmitter:

1. In Helix Administrator, click **Broadcast Distribution>Transmitter**.
2. In the **Source Name** box, enter a name that identifies this transmitter. Because this name appears in links to the split broadcast, use letters and numbers, but not spaces. Examples in this chapter use `Japan` as the transmitter name.
3. In the **Broadcast Receivers** area, click the "+" icon, and change the name in the **Edit Receiver Name** box to the name or description for the Helix Universal Server that will receive the broadcast stream. This name is for your reference only, and is not used in the broadcast.
4. For **Source Path**, specify the mount point and, optionally, a path and a stream name used for broadcasts from this transmitter. The default is `/broadcast/`, and you can use just this mount point to send the receiver all broadcast streams delivered to this transmitter by Helix Producer or SLTA.

   If you use an earlier version of RealProducer, change the broadcast mount point to `/encoder/`. For Windows Media broadcasts, the default is `/wmtencoder/`. And for QuickTime or general RTP-based broadcasts, the mount points are `/qtencoder/` and `/rtpencoder/`, respectively. If you are using redundant encoders with any media format, use the mount point `/redundant/`.

   > **For More Information:** For more on using a path and stream name, see "Multiple Splitting Definitions" on page 174.

5. In the **Receiver IP Address or Hostname** box, enter the address or host name of the Helix Universal Server that receives this broadcast stream. If you plan to multicast the stream from this transmitter, you must specify an appropriate class D multicast address.
6. For **Local IP Address**, specify the network address used for transmitting this broadcast. The receiver requires this address for resend requests.

   > **Tip:** If you have a multi-homed machine that uses several IP addresses, be sure to use an IP address bound to Helix Universal Server, as described in "Binding to an IP Address" on page 62.

7. From the **Transport** list, select the transport method for transmitter-to-receiver communication. You must set the same transport on both the

transmitter and the receiver. The options, listed in order of recommended use, are the following:

- udp/unicast

  This is the most common option. It unicasts the stream from the transmitter to the receiver over UDP.

- udp/multicast

  If your network hardware is multicast enabled, this option is the most bandwidth-efficient. Selecting this option requires the receiver to use a class D multicast address.

- tcp

  Use this option only if broadcasting with UDP is not possible. TCP broadcasts are less efficient because they require more network overhead.

8. Several fields and lists let you configure optional transmitter features:

   a. To enable SureStream-aware splitting, ensure that `Enabled` is selected in the **SureStream Aware Splitting** box. Otherwise, select `Disabled`. The setting has no effect if you are not splitting a SureStream broadcast. For more information, see "SureStream-Aware Splitting" on page 167.

   b. If you selected the **udp/multicast** transport option, enter a number in the **Multicast Time to Live (TTL)** box. For a list of possible TTL values, refer to "Packet Time to Live" on page 143. The default is 16.

   c. For **Error Correction Rate**, you can set the percentage of corrective packets sent. The default value for Internet splitting is 20, which adds a 20% bandwidth overhead to the stream for error correction. A higher number results in more reliable delivery of data, but consumes proportionally more network bandwidth. If you're splitting within a local area network, you can set this to a lower value or to `0` (zero) because you are less likely to need error correction.

      Note: If you lower the error correction rate, you may need to raise the receiver buffering time, as described in "Error Correction and Receiver Buffering" on page 177.

   d. The **Metadata Transmit Rate** field sets the frequency in seconds at which special packets are sent from the transmitter to the receiver. These packets describe the stream being split, and are required for the receiver to process the incoming stream. Use a number from 1 to 60. A

lower number may result in lower startup latency on a receiver, but consumes more network bandwidth. See “Stream Acquisition Latency” on page 176 for more information.

e. To improve quality of service, receivers can re-request packets that arrived in poor quality, or not at all. Select `Yes` in **Honor Resend Requests** to enable packet resending. Because this option requires a back channel from the receiver to the transmitter, it increases bandwidth use slightly to enable the resend traffic.

f. Set **Relay Live Broadcasts** to `Yes` if this transmitter is a relay that forwards streams from one Helix Universal Server to another Helix Universal Server, as described in “One-to-One Chaining” on page 169. If the originating encoder delivers the stream to this Helix Universal Server, set the value to `No`.

> **Note:** A `Yes` value for **Relay Live Broadcasts** means that this server’s address does not appear in the media request URL on a receiver further down a splitting chain. The server will still forward a stream if this value is `No`. But in this case, the server’s address must appear in the request URLs on receivers.

9. The **Port Range** boxes set the ports on receivers to which the stream is sent. If you change the default ports, RealNetworks recommends using a range of 20 ports. If you cannot use a range of 20 ports, reserve at least 1 port per Megabit of broadcast stream bandwidth.
10. To secure stream transmissions, select `Basic` from the **Security Type** list, and type a password in the **Password** box. The transmitter passes this word to the receiver to verify its identity. To turn off the password requirement, choose `None` from the **Security Type** list. The password needs to be defined on the receiver as well.
11. Click **Apply**.

Configuring a Pull Splitting Transmitter

The following procedure explains how to set up Helix Universal Server as a pull splitting source. Pull splitting definitions are entirely independent of push splitting information. With pull splitting, you do not define specific receivers as you do in push splitting. Instead, you set basic parameters that identify the broadcast stream. Then, any receiver can pull the stream. In other

words, the pull splitting transmitter definition does not contain any information about potential receivers.

➤ To configure the transmitter for pull splitting:

1. In Helix Administrator, click **Broadcast Distribution>Transmitter**.
2. In the **Pull Splitting Sources** area, click the "+" icon and edit the name that appears in the **Edit Source Name** box. This name is for your reference only, and does not appear in URLs.
3. In the **Source Path** box, enter the path through which live streams are sent, typically `/broadcast/`, `/encoder/`, `/redundant/`, `/wmtencoder/`, `/qtencoder/`, or `/rtpencoder/`, as explained in Chapter 7. The default value of `/broadcast/` means that this transmitter definition allows receivers to pull any broadcast sent to the transmitter from Helix Producer in push or pull mode.

   Tip: Optionally, you can specify a path and stream name to define only specific broadcasts that can be pulled. For an example of using source paths, refer to "Multiple Splitting Definitions" on page 174.

4. For **Local IP Address**, specify the network address the transmitter uses. This is the address the receiver contacts to pull the stream. All pulled streams are unicast over UDP when possible, or TCP if UDP is not available.
5. In the **Listen Port** box, type a port number on which this transmitter listens for requests. These port numbers are used in request URLs. If you leave this field blank, Helix Universal Server uses the value `2030`.

   Tip: All pull splitting definitions can use the same listen port, as long as no simultaneous broadcasts use the same stream name. If you want to broadcast the same stream name at the same time through different pull splitting definitions, give each definition a unique listen port number.

6. If you want to enable SureStream-aware splitting, select **Enabled** in the **SureStream Aware Splitting** box. For more information, see "SureStream-Aware Splitting" on page 167.

7. Type a password in the **Password** box. The receiver will use this word to verify its identity when it requests a stream. To turn off this feature, choose `None` from the **Security** list.

   Warning! Password validation is strongly recommended for all pull-splitting broadcasts. If you turn off validation, any server can pull the stream from your transmitter.

8. Click **Apply**.

Setting Up a Receiver

The following sections describe how to define basic receiver information, and how to enable that receiver to make pull splitting requests. To configure a receiver, you need to know the following settings on the transmitter:

- broadcast source (mount point, path, and stream name)
- transmission port range
- transmitter address
- security type and password
- transport method (unicast, multicast, or TCP)
- listen port (pull splitting only)

Defining Basic Receiver Information

For a pull splitting or push splitting receiver, you set up basic information about the receiver as described in the following procedure. Just as a transmitter definition lists properties of receivers, the receiver defines properties of transmitters.

➤ To configure a receiver:

1. In Helix Administrator, click **Broadcast Distribution>Receiver**.
2. The **Mount Point** box defines the mount point used in URLs to the broadcast on the receiver. It identifies the source as a live broadcast rather than a clip. The default is `/broadcast/`.

   Tip: A broadcast may go out from a transmitter on a different mount point, such as `/wmtencoder/` for Windows Media. Each

receiver can broadcast the split stream from its /broadcast/ mount point regardless of the media format, however.

3. In the **Broadcast Transmitters** area, click the "+" icon and enter a descriptive name for the transmitter in the **Edit Transmitter Name** box.
4. For **Transmitter Address**, type the host name or IP address of the transmitter. To receive broadcast streams from a range of transmitters, set a bit mask around the specified IP address through the **Transmitter Netmask** list. See Appendix B for information about using a bit mask.
5. In the **Port Range** boxes, set the ports on which the stream is received. The port values should match the settings on the transmitter.
6. In the **Transport** box, select the same option that's in use on the transmitter. If you select udp/multicast, you must also add to the **Multicast Address** field a class D multicast address. This address must match the value in the transmitter's **Receiver IP Address or Hostname** box.
7. To re-request packets that did not arrive at the receiver, select Yes for **Resend Requests**. This option provides greater quality, but requires more network bandwidth. If you enable resend requests, the transmitter needs to have **Honor Resend Requests** set to Yes.
8. For **Security Type** and **Password**, use the same values set on the transmitter.
9. If you are not enabling pull splitting on the receiver, click **Apply**. Otherwise, configure pull splitting as described below.

Enabling Pull Splitting Requests

To enable pull splitting, you set the receiver properties explained in "Defining Basic Receiver Information" on page 185. Then, add the pull splitting information described in the following procedure.

➤ **To enable the receiver for pull splitting:**

1. On the **Broadcast Distribution>Receiver** page, select the receiver you want to configure for pull splitting, and scroll down to bottom of the page.
2. From the **Enable Pull Splitting Requests** list, select Yes.
3. In the **Pull Splitting Virtual Path** box, type a value in the form of a mount point, such as /split/. You will use this virtual path in URLs to indicate that the stream is pulled.

4. For **Error Correction Rate**, set the percentage of corrective packets sent by the transmitter (the FEC rate set on a transmitter is used only with push splitting). The default value for Internet splitting is 20, which adds a 20% overhead to the stream for error correction. A higher number results in more reliable delivery of data, but consumes proportionally more network bandwidth. If you're splitting within a local area network, you can set this to a lower value or to `0` (zero) because you are less likely to need error correction.

   Note: If you lower the error correction rate, you may need to raise the receiver buffering time, as described in "Error Correction and Receiver Buffering" on page 177.

5. The **Metadata Transmit Rate** box sets the rate at which the transmitter sends packets describing the session (the metadata rate set on a transmitter is used only with push splitting). A higher number results in better quality and higher startup latency on the receiver, but consumes less network bandwidth. Use a number from 1 to 60. The default value is 30, which sends the metadata once every 30 seconds, adding up to 30 seconds of latency to the initial pull request.
6. To split over a connection in which stream packets are likely to be lost, you can set the **Pull Splitting Backchannel Transport** field to `TCP`. This setting results in a highly reliable connection that requires slightly more network overhead.
7. Click **Apply**.

Linking to Split Content

A link to a split stream points to the receiver, and indicates the transmitter where the stream began. Links for push splitting and pull splitting streams are different. For both types of links, you can use URL aliases, which are especially useful for the longer pull splitting links. The following sections explain link formats in general, and provide example links for RealMedia broadcasts. For broadcasts in other formats, you need to use transmitter mount points and stream names as appropriate for that format.

Tip: For examples of links to basic broadcasts in different media formats, see "Linking to Unicasts" on page 134. The links to split streams build on those basic formats.

Writing Push Splitting Links

Push splitting links point to the Helix Universal Server receiver, but include the source name of the transmitter to identify the broadcast. These URLs are relatively simple, and build on the basic unicast URL format.

Linking from a Web Page

A Web page link to a pushed RealMedia broadcast in which a Helix Universal Server receiver uses the default port 80 for HTTP might look like this:

```
http://receiver.example.com/ramgen/broadcast/Japan/broadcast/news/live.rm
```

- The URL first specifies the IP address or host name of the receiver, as in `receiver.example.com`. Include the HTTP port number if port 80 is not used.
- The `/ramgen/` mount point launches RealOne Player, as explained in "Using a Client Launch Utility" on page 78. For a Windows Media broadcast, you use `/asxgen/`.
- The default broadcast mount point on a receiver is `/broadcast/`, but each receiver may define a different mount point, as described in "Defining Basic Receiver Information" on page 185.
- Following the broadcast mount point, you specify the transmitter name, such as `/Japan/`. The **Source Name** box of the transmitter definition sets this name, as explained in "Defining a Push Transmitter" on page 180.
- The URL next specifies the transmitter's default broadcast mount point and, optionally, its virtual path. These are defined in the transmitter's **Source Path** box. The default is just the `/broadcast/` mount point, but the mount point is typically different for formats other than RealMedia. The mount point may also include a virtual path, as in `/broadcast/news/`.
- The requested file, shown above as `live.rm`, is the stream name specified by the encoder. With Windows Media broadcasts, the stream name is defined on the transmitter, as explained in "Broadcasting Windows Media" on page 130. For QuickTime and RTP-based broadcasts, it's the name of the SDP file.

Linking through a Relay

It typically does not matter if one or more relays exist between the receiver and the transmitter, as illustrated in "One-to-One Chaining" on page 169. The link

refers only to the receiver and the originating transmitter, as long as each relay has its **Relay Live Broadcasts** field set to `Yes`.

If one or more relays in the chain has **Relay Live Broadcasts** set to `No`, however, you need to include those servers' transmitter names in the URL. Here is an example of a Web page URL that lists two relays along with the transmitter and receiver address:

```
http://receiver.example.com/ramgen/broadcast/LosAngeles/broadcast/
Sydney/broadcast/Japan/broadcast/news/live.rm
```

In this example, the `Japan` transmitter is the originating transmitter, just as in the preceding examples. The stream travels from this transmitter to the `Sydney` transmitter, then to the `LosAngeles` transmitter, before arriving at the receiver. Note that the URL components reflect the exact order in which the stream travels through the chain.

Linking to a Transmitter or Relay

An originating transmitter, as well as any relay in the chain, can also deliver the broadcast to media players. URLs to an originating transmitter are standard unicast URLs, as described in "Linking to Unicasts" on page 134. The Web-page URL to the broadcast on the `Japan` transmitter would therefore look like this:

```
http://transmitter.example.com/ramgen/broadcast/news/live.rm
```

To link to the broadcast on a relay, you treat the relay as if it were the receiver at the end of the splitting chain. It does not matter if the relay has its **Relay Live Broadcasts** value set to `Yes` or `No`. For example, the Web page link to the broadcast on the `LosAngeles` relay, which links through the `Sydney` relay to the `Japan` transmitter looks like this:

```
http://relay2.example.com/ramgen/broadcast/Sydney/broadcast/
Japan/broadcast/news/live.rm
```

Linking from a Ram or SMIL File

You can also launch a broadcast through a Ram file or SMIL file, as described in "Using Metafiles" on page 77. The URL format is similar to the preceding examples, but specifies RTSP or MMS, and omits the `/ramgen/` or `/asxgen/` parameter. In the following example of a URL to a receiver, the port number is omitted, which means that port 554 is used for RTSP:

```
rtsp://receiver.example.com/broadcast/Japan/broadcast/news/live.rm
```

Here is a sample URL to the unicast on the `Japan` transmitter:

```
rtsp://transmitter.example.com/broadcast/news/live.rm
```

Creating Pull Splitting Links

Pull splitting links are more complex than push splitting links. The link URL tells the receiver where to pull the stream by giving the transmitter's address and listen port. If you have a relay chain as described in "One-to-One Chaining" on page 169, a link to a broadcast on a specific receiver must indicate all of the preceding links in the chain in the proper order. URL aliases can shorten the published URLs, as well as mask the transmitter addresses.

> **Note:** When pull-splitting Windows Media streams, you must use URL aliases because Windows Media Player does not recognize the URL format used for pull splitting.

Linking from a Web Page

A Web page link to a pulled RealMedia broadcast in which a Helix Universal Server receiver uses the default port 80 for HTTP might look like the following example, in which the URL is shown on two lines to clarify the link portions. The first line gives the receiver information, while the second line supplies the transmitter parameters:

```
http://receiver.example.com/ramgen/broadcast/split/
transmitter.example.com:2030/broadcast/news/live.rm
```

- The URL first specifies the IP address or host name of the receiver, as in `receiver.example.com`. Include the HTTP port number if port 80 is not used.
- The `/ramgen/` mount point launches RealOne Player, as explained in "Using a Client Launch Utility" on page 78. For a Windows Media broadcast, you use `/asxgen/`.
- The default broadcast mount point on a receiver is `/broadcast/`, but each receiver may define a different mount point, as described in "Defining Basic Receiver Information" on page 185.
- Following the broadcast mount point, you specify a path that indicates a pull splitting broadcast, as in `/split/`. The **Pull Splitting Virtual Path** box of the receiver's pull splitting section sets this name, as explained in "Enabling Pull Splitting Requests" on page 186.
- The link's transmitter portion lists the transmitter's IP address or host name, along with its listen port, as in `transmitter.example.com:2030`. The

section "Configuring a Pull Splitting Transmitter" on page 183 describes these values.

- The URL next specifies the transmitter's default broadcast mount point and, optionally, its virtual path. These are defined in the **Source Path** box of the pull splitting section in the transmitter definition. The default is just the `/broadcast/` mount point, but the mount point is typically different for formats other than RealMedia. The mount point may also include a virtual path, as in `/broadcast/news/`.
- The requested file, shown above as `live.rm`, is the stream name specified by the encoder. With Windows Media broadcasts, the stream name is defined on the transmitter, as explained in "Broadcasting Windows Media" on page 130. For QuickTime and RTP-based broadcasts, it's the name of the SDP file.

> **For More Information:** You can also link to the transmitter as described in "Linking to a Transmitter or Relay" on page 189.

Linking through a Relay

If the stream travels through a relay before reaching the receiver, the URL must include the relay address. When a media player requests the broadcast from the receiver, the receiver contacts the relay to pull the stream, which, in turn, contacts the transmitter to pull the stream. The relay information comes between the transmitter and receiver information. As with the transmitter, the URL gives the relay's address, listen port, and broadcast mount point:

```
http://receiver.example.com/ramgen/broadcast/split/
relay.example.com:2030/broadcast/
transmitter.example.com:2030/broadcast/news/live.rm
```

Linking from a Ram or SMIL File

You can also launch a pull splitting broadcast through a Ram file or SMIL file, as described in "Using Metafiles" on page 77. The URL format is similar to the preceding examples, but specifies RTSP or MMS, and omits the `/ramgen/` or `/asxgen/` parameter. In the following example of a URL to a receiver, the port number is omitted, which means that port 554 is used for RTSP:

```
rtsp://receiver.example.com/broadcast/split/
transmitter.example.com:2030/broadcast/news/live.rm
```

Using URL Aliases

The section "Setting Up Aliases" on page 84 explains how to create an alias for URL elements. This is a handy way to shorten URLs and mask transmitter addresses in pull splitting URLs. Aliases are optional except when you use pull splitting in a Windows Media broadcast. Windows Media Player does not recognize transmitter addresses and listen ports in pull splitting URLs.

You set up the appropriate alias on each Helix Universal Server that receives broadcast requests from media players. To illustrate the use of an alias, consider the pull splitting example shown in the preceding section:

```
http://receiver.example.com/ramgen/broadcast/split/
relay.example.com:2030/broadcast/
transmitter.example.com:2030/broadcast/news/live.rm
```

On the receiver that handles this broadcast request, you could define the following alias to mask the relay and transmitter addresses:

URL component:	`relay.example.com:2030/broadcast/` `transmitter.example.com:2030/broadcast/news/`
Alias:	`pull/`

Your published URL would then look like this:

```
http://receiver.example.com/ramgen/broadcast/split/pull/live.rm
```

Note: You can use just one alias in each URL.

CHAPTER

10

SIMULATED LIVE BROADCASTS

The Simulated Live Transfer Agent (SLTA) is a Helix Universal Server utility that allows you to stream a prerecorded clip or a broadcast archive as if it were a live event. Using SLTA, you can deliver encore presentations, or simulate radio or TV programming using any number of clips. This chapter covers the basic and advanced modes of SLTA, explaining how to set up SLTA, create playlists, and run your simulated live broadcast.

Understanding Simulated Live Broadcasts

SLTA is a command line tool installed with Helix Universal Server. Running on Windows or UNIX, it sends a media stream to Helix Universal Server, which then broadcasts the stream to media players. SLTA supports all broadcasting features:

- **multicasting**—SLTA can deliver the same stream to multiple Helix Universal Servers on a multicast-enabled network.
- **push delivery**—SLTA can initiate the broadcast by contacting one or more Helix Universal Servers and delivering the stream. If you are unicasting rather than multicasting to each Helix Universal Server, the number of connections is limited primarily by the outgoing bandwidth on the machine that hosts SLTA.

  For More Information: See "Bandwidth Consumption" on page 177 for more about bandwidth use in splitting arrangements.

- **pull delivery**—Helix Universal Server can initiate the broadcast by contacting SLTA and acquiring the stream when the first media player requests the broadcast. SLTA supports connections from multiple pull-enabled receivers. The number of connections is limited primarily by the outgoing bandwidth on the machine that hosts SLTA.

- **broadcast redundancy**—You can run separate SLTA applications on different machines to create primary and backup streams.
- **SureStream-aware splitting**—SLTA can conserve bandwidth by delivering each SureStream stream only when it is requested.

For More Information: For the basics of splitting, see "Understanding Splitting" on page 161.

Broadcast Formats

SLTA can simulate an audio or video broadcast in RealMedia, QuickTime, MPEG (including MP3), AU, WAV, or Windows Media format. Other RealNetworks formats, such as RealText and RealPix, can be broadcast through separate applications. Sample RealText and RealPix broadcast applications are included with the Software Development Kit (SDK), available for download at this Web page:

http://proforma.real.com/rnforms/resources/server/realsystemsdk/index.html

Tip: To simulate a broadcast using QuickTime clips, you can also use Playlist Broadcaster to deliver prerecorded media to Helix Universal Server, which then broadcasts it as described in "Broadcasting QuickTime, MPEG, and RTP-Based Media" on page 131.

Basic and Advanced Modes

SLTA has two modes: basic and advanced. Basic mode simulates account-based broadcasting in Helix Producer. It allows you to push the broadcast stream to a single Helix Universal Server. It automatically sets to predefined values certain stream delivery variables that are configurable in advanced mode. For example, basic mode always uses a 10% forward error correction rate and a 30-second data acquisition interval.

In advanced mode, SLTA functions like a transmitter in a splitting setup, sending a stream to one or more Helix Universal Servers configured as receivers, as described in "Setting Up a Receiver" on page 185. The receivers

then broadcast the stream to media players. The following table summarizes the features available in basic and advanced modes.

SLTA Basic and Advanced Mode Features and Requirements

Feature or Requirement	Basic	Advanced	Reference
RealMedia, Windows Media, QuickTime, or MPEG	**yes**	**yes**	page 194
Helix Universal Server configured as a receiver	no	**yes**	page 196
SLTA configuration file necessary	no	**yes**	page 200
pull delivery	no	**yes**	page 206
push delivery	**yes**	**yes**	page 202
push delivery to multiple servers	no	**yes**	page 203
multicast delivery to multiple servers	no	**yes**	page 203
SureStream-aware delivery	no	**yes**	page 203
configurable forward error correction	no	**yes**	page 203
ignore server resend requests	no	**yes**	page 203
configurable metadata transmit rate	no	**yes**	page 203
path name preceding stream name	no	**yes**	page 205
SLTA-buffered transport	no	**yes**	page 206
broadcast redundancy	**yes**	**yes**	page 214
UDP transport	**yes**	**yes**	page 217
TCP transport	**yes**	**yes**	page 217
clip playlists	**yes**	**yes**	page 207
shuffle play	**yes**	**yes**	page 216
clip title, author, and copyright overrides	**yes**	**yes**	page 217
wallclock synchronization	**yes**	**yes**	page 217

Helix Universal Server Setup

Using SLTA requires a small amount of setup on Helix Universal Server.

Basic Mode Configuration

SLTA's basic mode is authenticated, so you need to set up a user name and password on Helix Universal Server:

- Although you can use the name and password that logs you into Helix Administrator, RealNetworks recommends that you define a new name and password as described in “Encoder Validation” on page 250.
- You select the encoder realm that contains the SLTA user name and password under **Broadcasting>RealNetworks Encoding**, as described in “Setting Up Account-Based Broadcasting” on page 126.

> **Tip:** In basic mode, SLTA uses the port range defined on the RealMedia broadcasting page (**Broadcasting>RealNetworks Encoding**). The default settings are generally sufficient.

Advanced Mode Configuration

When you run SLTA in advanced mode, you configure Helix Universal Server as a receiver, as described in “Setting Up a Receiver” on page 185. RealNetworks recommends that you do this before you define your SLTA configuration file.

Command Line Operation

When you’re ready to broadcast, you run SLTA from the command line, specifying the configuration file, the clip or playlist, and any additional options. For each broadcast, you define a single stream name, such as `encore.rm`, which is used in place of the actual clip or playlist name. When viewers click the link to this stream, they join the broadcast in progress.

> **Note:** To run SLTA, you must be able to open a command prompt on your operating system, and navigate to a specific directory. This chapter does not explain how to perform these functions.

SLTA Quick Start Tutorials

The following tutorials are optional. They introduce you to the procedures for simulating a broadcast, using the smallest set of variables and commands required to configure and run SLTA. Once you understand the overall operation of SLTA, you’ll more easily pick up the many additional configuration features and command line options that you can use.

> **Note:** In the following tutorials, you run SLTA on your Helix Universal Server machine. In a production environment,

however, RealNetworks recommends that you run SLTA and Helix Universal Server on separate machines.

Quick Start for SLTA Basic Mode

In this tutorial you run SLTA in basic mode.

➤ To simulate a basic mode broadcast with a prerecorded clip:

1. Anywhere on your Helix Universal Server computer, create a directory named `Simulate`, and copy the following files to it:
   a. The `slta.exe` (Windows) or `slta` (UNIX) file from the Helix Universal Server `Bin` directory.
   b. The `slta.bat` (Windows) or `slta.sh` (UNIX) file from the Helix Universal Server `Bin` directory.
   c. The `real9video.rm` clip from the Helix Universal Server `Content` directory. You can use another RealMedia clip if you wish.

   The location of Helix Universal Server in a default installation on Windows is `C:\Program Files\Real\Helix Server`.

2. Open a command prompt and navigate to your `Simulate` directory. Enter one of the following commands to transmit the `real9video.rm` clip (or another clip if you wish) under the stream name `live.rm`. On Windows:

   `slta.bat 127.0.0.1 80 *name password* live.rm real9video.rm`

   On UNIX:

   `slta.sh 127.0.0.1 80 *name password* live.rm real9video.rm`

   - You need to substitute the actual Helix Universal Server address for `127.0.0.1` if your files are not on the same machine as Helix Universal Server, or you're not using the local host address.
   - The `80` entry refers to the standard HTTP port, which may be different on your Helix Universal Server. See "Defining Communications Ports" on page 59 for port information.
   - For this exercise, use the name and password you use to log into Helix Administrator.

3. Start RealOne Player, give the **File>Open** command, and enter the following URL:

   `rtsp://127.0.0.1/broadcast/live.rm`

You need to substitute the actual Helix Universal Server address if your RealOne Player is not on the same machine as Helix Universal Server, or you're not using the local host address. You'll also need to include the RTSP port number if Helix Universal Server does not use port 554.

4. When you finish testing, stop SLTA from the command line by pressing **Ctrl+c** on Windows, or giving the `kill` command with the process ID on UNIX. After a few seconds, the broadcast stops playing in RealOne Player.

Quick Start for SLTA Advanced Mode

Follow the steps in this tutorial to run SLTA in advanced mode, creating both a transmitter and a receiver on your Helix Universal Server computer.

➤ To simulate an advanced mode broadcast with a prerecorded clip:

1. Anywhere on your Helix Universal Server computer, create a directory named `Simulate`, and copy the following files to it:
   a. The `slta.exe` (Windows) or `slta` (UNIX) file from the Helix Universal Server `Bin` directory.
   b. The `slta.bat` (Windows) or `slta.sh` (UNIX) file from the Helix Universal Server `Bin` directory.
   c. The `real9video.rm` clip from the Helix Universal Server `Content` directory. You can use another RealMedia clip if you wish.

   The location of Helix Universal Server in a default installation on Windows is `C:\Program Files\Real\Helix Server`.

2. Through Helix Administrator, configure Helix Universal Server as a receiver as described in "Setting Up a Receiver" on page 185. Enter the following values, accepting the default values for any setting not listed.

Helix Universal Server Receiver Values for SLTA Quick Start

Setting	Value	Notes
Transmitter Name	`Simulation`	A transmitter can have any name, but the name should not include spaces.
Transmitter Address	`127.0.0.1`	Using this value requires that your Helix Universal Server binds to the local host address, which it does by default. If you've changed this as described in "Binding to an IP Address" on page 62, use the actual network address or host name.

(Table Page 1 of 2)

Helix Universal Server Receiver Values for SLTA Quick Start (continued)

Setting	Value	Notes
Transmitter Netmask	`32 bits`	This is required when using local host. It's not required if using a full address.
Security Type	`None`	This option requires no password. In an actual broadcast, RealNetworks recommends that you always use `Basic` security.

(Table Page 2 of 2)

3. In a text editor, enter the following XML-based syntax, saving the file as `transmit.cfg` in your `Simulate` directory. You'll need to change the `Address` variable if you're not using the local host address. Also, make sure that the `PortRange` variable matches the setting on the receiver. Values must be quoted, and variable tags must end with a slash (/).

```
<List Name="BroadcastDistribution">
   <Var SourceName="Simulation"/>
   <List Name="Destinations">
      <List Name="TestReceiver">
         <Var PathPrefix="*"/>
         <Var PortRange="30001-30020"/>
         <Var Address="127.0.0.1"/>
         <Var Protocol="udp/unicast"/>
         <List Name="Security">
            <Var Type="None"/>
         </List>
      </List>
   </List>
</List>
```

> **Note:** This configuration sets up SLTA as a push transmitter. The variables for pull splitting, which are not shown in the preceding example, are different.

4. Open a command prompt and navigate to your `Simulate` directory. Enter one of the following commands to transmit the `real9video.rm` clip (or another clip if you wish) under the stream name `live.rm`. On Windows:

   ```
   slta.bat -c transmit.cfg live.rm real9video.rm
   ```

   On UNIX:

   ```
   slta.sh -c transmit.cfg live.rm real9video.rm
   ```

5. Start RealOne Player, give the **File>Open** command, and enter the following URL:

```
rtsp://127.0.0.1/broadcast/Simulation/live.rm
```

You need to substitute the actual Helix Universal Server address if your RealOne Player is not on the same machine as Helix Universal Server, or you're not using the local host address. You'll also need to include the RTSP port number if Helix Universal Server does not use port 554.

6. When you finish testing, stop SLTA from the command line by pressing **Ctrl+c** on Windows, or giving the `kill` command with the process ID on UNIX. After a few seconds, the broadcast stops playing in RealOne Player.

Configuring SLTA for Advanced Mode

You do not need to configure SLTA to run in basic mode. In advanced mode, SLTA relies on an XML-based configuration file for instructions on transmitting to each Helix Universal Server receiver. When you run SLTA, you indicate which configuration file to use. This allows you to define multiple configuration files for different transmission scenarios. The following sections explain how to set up your configuration file for advanced mode broadcasting.

> **Tip:** It's a good idea to set up Helix Universal Server as a receiver before you write your configuration file. To do this, follow the instructions in "Setting Up a Receiver" on page 185.

Using the Configuration Template

The main Helix Universal Server installation directory contains a template for the SLTA configuration file, `slta.cfg`. You can edit this template with any text editor, and save new configuration files as plain text under any name. The `.cfg` extension is recommended, but not necessary. The following example shows the contents of the `slta.cfg` template:

```
<List Name="BroadcastDistribution">
   <Var SourceName="ExampleSourceName"/>
   <List Name="Destinations">
      <List Name="ExampleName">
         <Var PathPrefix="*"/>
         <Var PortRange="30001-30020"/>
         <Var AcquisitionDataInterval="30"/>
         <Var FECLevel="0"/>
         <Var SureStreamAware="0"/>
         <Var BufferlessTransport="1"/>
```

```
            <Var LocalAddress="0.0.0.0"/>
            <Var Address="127.0.0.1"/>
            <Var TTL="16"/>
            <Var ResendSupported="0"/>
            <Var Protocol="udp/unicast"/>
            <List Name="Security">
               <Var Type="Basic"/>
               <Var Password="ExamplePassword"/>
            </List>
         </List>
      </List>
   <List Name="Pull Settings">
       <List Name="PullSource1">
            <List Name="Security">
               <Var Type="Basic"/>
               <Var Password="ExamplePassword"/>
            </List>
            <Var SureStreamAware="0"/>
            <Var ListenPort="2030"/>
            <Var PathPrefix="/"/>
            <Var LocalAddress="0.0.0.0"/>
         </List>
   </List>
</List>
```

Tip: If you are not familiar with XML-formatted lists and variables, read “Editing the Configuration File” on page 382 for an overview.

Setting Basic Transmitter Properties

The configuration template has an outer list named `BroadcastDistribution`, which you should not change. This main list contains a variable for the transmitter name, and separate sections for push splitting and pull splitting variables. Typically, you need to define only one of these sections depending on the type of splitting you use:

```
<List Name="BroadcastDistribution">
   <Var SourceName="ExampleSourceName"/>
   <List Name="Destinations">
      <List Name="ExampleName">
         ...all push splitting variables here...
      </List>
   </List>
```

```
    <List Name="Pull Settings">
        ...all pull splitting variables here...
    </List>
</List>
```

Tip: When using push splitting, you can delete the pull splitting variables, and vice versa. This is not necessary, though, and if you do so, be careful not to delete an element you need, such as a closing </List> tag. Missing elements will cause an error when you run SLTA.

Naming the Transmitter

Whether you use push splitting or pull splitting, you define a name for the SLTA transmitter in the SourceName variable at the top of the file:

```
<Var SourceName="ExampleSourceName"/>
```

If you plan to run multiple instances of SLTA on the same machine simultaneously, each configuration file should define a different source name. This name appears in Web page links for push transmissions, so it should not include spaces. Here is an example:

```
<Var SourceName="BroadcastEncore"/>
```

Tip: It helps you to keep track of transmitters and receivers if you use same name you defined for SLTA in the **Broadcast Transmitters** box on the Helix Universal Server receiver.

Defining Push Splitting

In push splitting, SLTA initiates the connection, contacting one or more Helix Universal Server receivers, and delivering the simulated live stream. The push splitting section starts with the Destinations list, which encompasses a single receiver definition predefined as ExampleName. This name is for your convenience, and is not used in the broadcast. Change the name to any value that describes the Helix Universal Server receiver. Here's an example:

```
<List Name="Destinations">
    <List Name="Sydney Receiver">
        ...all push splitting variables here...
    </List>
</List>
```

Specifying Multiple Receivers

If you intend to deliver the same simulated live broadcast to more than one Helix Universal Server, duplicate the receiver list within the `Destinations` list, and give the second receiver a new name, as shown in the following example. Each receiver list then defines the same set of variables, but with different values as appropriate for each receiver. You can set up as many receivers as necessary:

```
<List Name="Destinations">
   <List Name="Sydney Receiver">
      ...all push splitting variables for the first receiver...
   </List>
   <List Name=”Tokyo Receiver">
      ...all push splitting variables for the second receiver...
   </List>
</List>
```

SLTA can unicast a separate stream to each receiver, or multicast a single stream on a multicast-enabled network. As explained in Chapter 9, you can also use a Helix Universal Server receiver to transmit (or “split”) the SLTA stream to any number of other receivers. This may be a better solution if your SLTA transmitter has limited outgoing bandwidth and you cannot multicast from SLTA to all of the receivers.

> **Tip:** Using virtual paths, you can define a single configuration file for multiple receivers, but deliver a stream only to certain receivers when you run SLTA. For more information, see “Directing Streams through Paths” on page 205.

Setting Push Configuration Values

The following table describes the SLTA push splitting variables you define for each receiver you use. Several transmitter variables correspond to receiver variables that must have a similar value. Minimally, you need to ensure that the `Address`, `PortRange`, `Protocol`, and `Password` variables match the settings on the receiver, as described in “Setting Up a Receiver” on page 185. The section

"Setting Up a Transmitter" on page 180 describes many of the transmitter features in greater detail.

SLTA Push Splitting Variables

Variable	Value	Function	Reference
PathPrefix	*|*path*	Streams all broadcasts with "*", or specifies a virtual path name.	page 205
PortRange	*port-port*	Indicates the range of ports set up on the receiver for data transmission.	page 183
AcquisitionDataInterval	*seconds*	Sets the frequency that the transmitter sends metadata information. Valid range is 0 to 60.	page 182
FECLevel	*integer*	Sets a percentage of corrective packets sent. The valid range is 0 to 100.	page 182
SureStreamAware	0|1	Indicates whether to use SureStream-aware transmission. The value 0 is "no," 1 is "yes."	page 182
BufferlessTransport	0|1	Uses the clip's timestamp information. The value 0 is "no," 1 is "yes." (Always set this value to 1.)	page 206
LocalAddress	*address*	Specifies the address or host name of the SLTA transmitter.	page 181
Address	*address*	Indicates the address or host name of the receiver.	page 181
TTL	integer	Sets the time to live for multicasting.	page 182
ResendSupported	0|1	Ignores (0) or honors (1) the receiver's resend requests.	page 183
Protocol	*protocol*	Sets the protocol used in transmitting streams. Choices are udp/unicast, udp/multicast, and tcp.	page 181
Type	Basic|None	Sets the type of security used.	page 183
Password	*password*	Provides a password for Basic security.	page 183

Tip: It's OK to ignore variables for features that you do not use. For example, TTL is used only with multicasts, so its setting does not affect unicasts.

Directing Streams through Paths

To broadcast all streams to all defined receivers, leave PathPrefix set to its default value of "*" for each receiver. As described in "Multiple Splitting Definitions" on page 174, however, you can use virtual path names and stream names to direct different broadcasts to different receivers. Suppose that you define three different receivers, and give each a different PathPrefix value as shown in the following example:

```
<List Name="Destinations">
   <List Name="Sydney Receiver">
      <Var PathPrefix="*"/>
      ....
   </List>
   <List Name="Tokyo Receiver">
      <Var PathPrefix="news/"/>
      ....
   </List>
   <List Name="Bombay Receiver">
      <Var PathPrefix="news/hourly.rm"/>
      ....
   </List>
</List>
```

The Sydney receiver, which uses the default path "*", gets all streams broadcast by SLTA using this configuration file. The Tokyo receiver gets only the streams that specify the news/ virtual path along with the stream name, which can be anything, when you start the broadcast. The Bombay receiver gets only the broadcast streams named news/hourly.rm.

The advantage of using virtual paths is that you can use one configuration file to deliver different streams to different receivers at different times. Instead of creating a separate configuration file for each receiver, you can define all receivers in one configuration file, then use the virtual paths to determine which receivers get which streams when you run SLTA.

Alternatively, you can create multiple configuration files to direct broadcasts to different receivers. Then, instead of specifying a path when starting the broadcast, you select the appropriate configuration file. Either method can create the same results, and you should choose the method that you find more convenient.

> **For More Information:** The section "Starting SLTA" on page 211 explains how to indicate the path when you start the broadcast.

Note: As noted in the table "SLTA Pull Splitting Variables" on page 207, pull splitting definitions can include a virtual path prefix, too. There is generally no need to set this path, however. In pull splitting, SLTA responds to requests. It does not actively direct streams as it does in push splitting. You can therefore leave the default path prefix of "/" set for pull splitting.

Using Bufferless Transport

For most clip types, you should leave `BufferlessTransport` set to its default value of "1". In this mode, SLTA transmits the clip according to the clip's internal timestamp information, which is appropriate for most streaming audio and video formats. If you set this variable to "0", SLTA buffers clip data itself and builds its own broadcast scheduler, which increases broadcast latency and processor overhead. You can enable bufferless transport only for clips that stream at a constant bit rate.

Defining Pull Splitting

In pull splitting, Helix Universal Server initiates the connection, contacting SLTA to acquire the stream when the first media player requests the simulated live broadcast. The pull splitting section starts with the `Pull Settings` list, which encompasses a single definition predefined as `PullSource1`. Change this definition name, which is not used in broadcasts, to anything that describes your SLTA transmitter:

```
<List Name="Pull Settings">
   <List Name="NewsEncoreTransmitter">
      <List Name="Security">
         <Var Type="Basic"/>
         <Var Password="ExamplePassword"/>
      </List>
      <Var SureStreamAware="0"/>
      <Var ListenPort="2030"/>
      <Var PathPrefix="/"/>
      <Var LocalAddress="0.0.0.0"/>
   </List>
</List>
```

Any number of receivers can pull the same stream from a single SLTA transmitter. You therefore do not need to replicate the pull splitting variables for each receiver in use, as you do with push splitting. You need to define multiple configuration files only if you intend to deliver different streams to

one or more receivers at the same time. You then run multiple instances of SLTA, using a different configuration file, stream name, and playlist for each instance.

Setting Pull Configuration Values

The following table describes the SLTA pull splitting configuration variables you define. Most configuration is done on the receiver, which must be enabled for pull splitting, as described in "Enabling Pull Splitting Requests" on page 186. The section "Setting Up a Transmitter" on page 180 describes transmitter features in greater detail.

SLTA Pull Splitting Variables

Variable	Value	Function	Reference
`PathPrefix`	`/`|*`path`*	Streams all broadcasts with "/", or specifies a virtual path name.	page 206
`ListenPort`	*`port`*	Set the port where SLTA listens for stream requests.	page 184
`SureStreamAware`	`0`|`1`	Indicates whether to use SureStream-aware transmission. The value `0` is "no," `1` is "yes."	page 184
`LocalAddress`	*`address`*	Specifies the address or host name of the SLTA transmitter.	page 184
`Type`	`Basic`|`None`	Sets the type of security used.	page 185
`Password`	*`password`*	Provides a password for `Basic` security.	page 185

Creating a Playlist

You do not need to write a playlist to broadcast a single clip. If you have a series of clips to broadcast, though, you list them in sequence in the playlist. A playlist can contain any number of clips. When you run SLTA, you can play the clips in the order they're listed, or in random order (shuffle play). Refer to "Using SLTA Options" on page 215 for information about command line options that affect playlists.

Writing a Basic Playlist

In a text file (file extension .txt), list on a separate line each file that you want SLTA to stream. If the files do not reside in the same directory as the playlist,

include either their full paths, or paths relative to the location of the playlist. In the following example, clips reside in the same directory as the playlist:

```
CompanyLogo.rm
Welcome.rm
President.rm
Treasurer.rm
Conclusions.rm
```

Warning! All files in the playlist must be in the same media format, and must be encoded at the same bit rate. If you use SureStream, all clips in the playlist must be SureStream clips encoded for the same set of rates. You cannot mix SureStream clips with single-rate RealAudio or RealVideo clips.

Tip: You can determine a clip's encoded bit rate or rates by opening it in RealOne Player, and giving the **View>Clip>Clip Source** command.

Adding Title, Author, and Copyright Information

Prerecorded clips often have title, author, and copyright information encoded into them. Through the playlist, you can override this information on a clip-by-clip basis. Or, you can set the same title, author, and copyright values for all clips. RealOne Player users display this information through the clip info command (**Ctrl+i**). Information about a certain clip displays only as that clip is broadcast.

Tip: Although a playlist isn't required to broadcast a single clip, you can write a playlist containing a single clip just to use the title, author, and copyright overrides.

Setting Information for All Clips

To include the same title, author, and copyright information for every clip, add `title`, `author`, and `copyright` tags to the beginning of the playlist. This information overrides any encoded information in the clip. End each tag with a colon, as shown in the following example:

```
title: Annual Report
author: Chris Lee, Executive Assistant
copyright: Copyright 2002
...clip1...
...clip2...
```

Tip: Presentation information, which you can specify in addition to clip information, is not supported directly through SLTA. You can add overall presentation information by delivering the simulated live broadcast through SMIL, however. For more information, see *Introduction to Streaming Media*.

Using Individual Clip Parameters

If you append individual `title`, `author`, and `copyright` parameters to a clip in the playlist, the specified information overrides the playlist values described above, as well as values encoded in the clip. You can use any combination of `title`, `author`, and `copyright` parameters for each clip. Use double quotation marks around values. Separate the first parameter from the clip file name with a question mark (?). Precede all subsequent parameters with an ampersand (&), as shown in this example:

```
Welcome.rm?title="Annual Report"&author="Chris Lee"&copyright="(c) 2002"
```

Mixing Information Styles

You can mix the different ways of delivering clip information. When you do this, keep in mind that clip information is used in the following order:

1. Information specified for each clip in the playlist.
2. Information specified for all clips at the start of the playlist.
3. Information encoded in each clip.

In the following playlist example, suppose that each clip has a title, author, and copyright value encoded directly in the clip:

```
copyright: (c) 2001-2002
CompanyLogo.rm?title="Welcoming Remarks"
Welcome.rm?title="Welcoming Remarks"
President.rm?title="President's Address"
Treasurer.rm?title="Treasurer's Summary"
Conclusions.rm?title="The Future is Bright"
```

Within this playlist, the `title` parameter for each clip overrides the titles encoded in the clips. The playlist's `copyright` parameter sets the same copyright value for all clips in the list, also overriding the clips' encoded values. No `author` values are specified, though, so each clip uses its encoded author text.

Running SLTA

This section describes the SLTA command line syntax, environment variables, and options. To run SLTA in advanced mode, you must first configure your Helix Universal Server receiver, set up your SLTA configuration file, and, optionally, write your playlist.

Moving SLTA to a Different Machine

RealNetworks recommends that you do not run SLTA from your Helix Universal Server machine. This reserves the Helix Universal Server's processor power for stream delivery alone. To install SLTA on another machine on your network, copy the `slta.exe` (`slta` on UNIX) executable file from the `Bin` subdirectory of the main Helix Universal Server directory. Then, copy to the same directory the following libraries, which reside in Helix Universal Server's `Plugins` and `Lib` directories.

SLTA Libraries

Library	Windows File Name	UNIX File Name
Windows Media ASF file format plug-in	`asfw3260.dll`	`asfwmpln.so.6.0`
SLTA main plug-in	`iqsl3260.dll`	`iqsltalib.so.6.0`
MP3 file format plug-in	`mp3f3260.dll`	`mp3f.so.6.0`
MPEG file format plug-in	`mpgf3260.dll`	`mpgf.so.6.0`
QuickTime file format plug-in	`qtff3260.dll`	`qtffplin.so.6.0`
remote broadcast plug-in	`remb3260.dll`	`rembrdcst.so.6.0`
RealMedia file format plug-in	`rmff3260.dll`	`rmffplin.so.6.0`
SDP stream description plug-in	`sdpp3260.dll`	`sdpplin.so.6.0`
local file system	`smpl3260.dll`	`smplfsys.so.6.0`
XML configuration plug-in	`xmlc3260.dll`	`xmlcfg.so.6.0`

Tip: You can run SLTA on an operating system different from the one that hosts your Helix Universal Server. To get the appropriate libraries, you can download the free version of Helix Universal Server for the operating system on which SLTA runs.

Setting Environment Variables

Running SLTA on your Helix Universal Server machine (but not on a different machine) requires that you set two environment variables. If you plan to use SLTA on your Helix Universal Server machine frequently, set the following environment variables permanently. This lets you run the SLTA executable file directly:

`SLTA_PLUGIN_PATH`	Full path to the directory that holds Helix Universal Server plug-ins
`SLTA_SUPPORT_PATH`	Full path to the directory that holds Helix Universal Server libraries (DLLs).

> **Tip:** If you plan to use SLTA only occasionally, you can run the provided batch (Windows) or shell (UNIX) file described in "Starting SLTA" on page 211 to set the variables for your current session.

Setting Variables on Windows

To set SLTA environment variables permanently on a default installation of Helix Universal Server on Windows, add the following two lines to your environment:

```
set SLTA_PLUGIN_PATH=C:\Program Files\Real\Helix Server\Plugins
set SLTA_SUPPORT_PATH=C:\Program Files\Real\Helix Server\Lib
```

If you installed Helix Universal Server in a location other than the default, modify the `C:\Program Files\Real\Helix Server` portion of the paths above to the actual base path where Helix Universal Server resides.

How you add variables to your environment depends on the operating system you're using. On Windows 2000, for example, you add environment variables with the **Start>Settings>Control Panel>System>Advanced>Enviornment Variables** command.

Starting SLTA

On Helix Universal Server, SLTA files are located in the `Bin` subdirectory of the main Helix Universal Server directory. Although you can run SLTA from this location, RealNetworks recommends that you move the necessary files to a different directory, preferably on a different machine. The file you run

depends on your machine, operating system, and whether you've set environment variables permanently.

SLTA Executable to Use

SLTA Location	Windows	UNIX
On a machine other than Helix Universal Server, as described in "Moving SLTA to a Different Machine" on page 210.	`slta.exe`	`slta`
On your Helix Universal Server machine with variables set permanently.	`slta.exe`	`slta`
On your Helix Universal Server machine without having set variables permanently.	`slta.bat`	`slta.sh`

Starting SLTA in Basic Mode

From a command prompt, use the following syntax to run SLTA in basic mode.

`slta[.`*`ext`*`]` *`server_address HTTP_port name password stream_name.ext`*
`clip.ext``|`*`playlist`*`.txt [-options]`

- Use the appropriate SLTA executable file as described in the preceding table.
- Next, specify the network address (IP address or DNS name) and HTTP port of your Helix Universal Server. See "Defining Communications Ports" on page 59 for port information.
- The name and password entries give the encoder access to Helix Universal Server. For more information, see "Helix Universal Server Setup" on page 195.
- For *`stream_name.ext`*, specify the name of the simulated live stream. This name appears in links to the broadcast, and uses the appropriate media extension, such as `.rm` for a RealMedia broadcast. When broadcasting QuickTime or MPEG, use `.mov` or an appropriate MPEG extension (such as `.mpeg` or `.mp4`) for the stream name. You do not need to use an SDP file.
- Next, you specify either the single clip you want to broadcast, or the playlist you wrote according to the instructions in "Creating a Playlist" on page 207. If the clip or playlist is not in the SLTA directory, specify the full path, or a path relative to the location of the SLTA executable file.
- Optionally, you can use command line options as described in "Using SLTA Options" on page 215. For example, SLTA loops a clip or playlist by

default. With command line options, you can specify how many repetitions to play.

Basic Mode Example

Running from a machine other than the Helix Universal Server computer, or with the environment variables set permanently on Helix Universal Server, you would use a command such as the following to broadcast a single RealMedia archive (`awards.rm`) as a simulated live event (`encore.rm`), using no additional SLTA options:

```
slta.exe helixserver.example.com 80 simulator k56weiq9 encore.rm awards.rm
```

Notes on Running SLTA in Basic Mode

- As SLTA begins the broadcast, it displays the progress indicator described in “Monitoring and Stopping SLTA” on page 217.
- SLTA contacts the receiver immediately to deliver the stream.
- You can verify connections on Helix Universal Server using the Server Monitor described in Chapter 18.

Starting SLTA in Advanced Mode

From a command prompt, use the following syntax to run SLTA in advanced mode.

`slta[.`*`ext`*`] -c `*`config_file`*`.cfg `*`stream_name.ext clip.ext`*`|`*`playlist`*`.txt [-options]`

- Use the appropriate SLTA executable file as described in “Starting SLTA” on page 211.
- For *config_file*`.cfg`, give the full or relative path to a configuration file you created according to instructions in “Configuring SLTA for Advanced Mode” on page 200.
- For *stream_name.ext*, specify the name of the simulated live stream. This name appears in links to the broadcast, and uses the appropriate media extension, such as `.rm` for a RealMedia broadcast. When broadcasting QuickTime or MPEG, use `.mov` or an appropriate MPEG extension (such as `.mpeg` or `.mp4`) for the stream name. You do not need to use an SDP file.

  If you defined virtual paths for receivers, as described in “Directing Streams through Paths” on page 205, you can include a virtual path in front of the stream name, as in `news/live.rm`. This path, which does not correspond to any directory on the machine, uses a Web-style forward slash even on Windows.

- Next, you specify either the single clip you want to broadcast, or the playlist you wrote according to the instructions in "Creating a Playlist" on page 207. If the clip or playlist is not in the SLTA directory, specify the full path, or a path relative to the location of the SLTA executable file.
- Optionally, you can use command line options as described in "Using SLTA Options" on page 215. For example, SLTA loops a clip or playlist by default. With command line options, you can specify how many repetitions to play.

Advanced Mode Example

Running from a machine other than the Helix Universal Server computer, or with the environment variables set permanently on Helix Universal Server, you would use a command such as the following to broadcast a single RealMedia archive (`awards.rm`) as a simulated live event (`encore.rm`), using no additional SLTA options:

```
slta.exe -c transmit.cfg encore.rm awards.rm
```

Notes on Running SLTA in Advanced Mode

- As SLTA begins the broadcast, it displays the progress indicator described in "Monitoring and Stopping SLTA" on page 217.
- If you set up push splitting, SLTA contacts the receiver immediately to deliver the stream.
- If you're using pull splitting, SLTA does not deliver the stream until the receiver requests it.
- You can verify connections on the Helix Universal Server receiver using the Server Monitor described in Chapter 18.

Running Redundant SLTA Encoders

In both basic and advanced modes, SLTA supports redundant encoders as described in "Using Broadcast Redundancy" on page 122. This allows the Helix Universal Server receiver to switch to a backup stream if the primary encoder stream fails. Although you can run two instances of SLTA on the same machine, this provides process redundancy only. For true redundancy, run an instance of SLTA on two separate machines that use different power supplies and network connections.

To set up SLTA redundancy, install SLTA on your backup machine as described in "Moving SLTA to a Different Machine" on page 210. Copy over

the configuration file, the playlist (if used), and the broadcasted clip or clips. Because the content is prerecorded, you want to start SLTA on both machines at the same time, or as close as possible. You may want to set up a script appropriate for your operating system that launches both SLTA processes on the two machines simultaneously.

The only difference between the two SLTA instances is the stream name used in the command that starts SLTA. Each stream name needs a delimiter that identifies it as the primary or the backup. The following example builds on an example in a preceding section by appending `.1` to the stream name to identify it as the primary stream:

```
slta.exe -c transmit.cfg encore.rm.1 awards.rm
```

With SLTA on your backup machine, you add `.2` to the stream name:

```
slta.exe -c transmit.cfg encore.rm.2 awards.rm
```

Using SLTA Options

SLTA provides optional command line arguments that affect the simulated live broadcast. The options appear last on the command line in any order, each option preceded by a hyphen. Here is an example:

```
slta.exe -c transmit.cfg encore.rm playlist.txt -e -n10 -r
```

The following table summarizes the options. Some options are useful only with playlists. Unless noted otherwise, all options are available in basic or advanced mode.

SLTA Command Line Options

Option	Function	Reference
`c`	Use the specified configuration file (advanced mode only)	page 213
`e`	Disable playlist title, author, and copyright information.	page 217
`f`	Force playlist title, author and copyright updates. This is the default.	page 217
`n`*`N`*	Play *`N`* files, then stop, where *`N`* is an integer that specifies the number of files to play. Using just `-n` sets up a continuous loop, which is the default behavior.	page 216
`r`	Transmit playlist files in a random order (shuffle play).	page 216
`t`	Force TCP transport instead of UDP (basic mode only).	page 217
`w`	Enable wallclock synchronization with other streams.	page 217

Modifying the Playback Order

By default, SLTA transmits a clip or playlist in a continuous loop. If you specify just one file, for example, SLTA continuously transmits that file until you stop the broadcast. You can use command line `-nN` and `-r` options to modify the default playback.

Specifying the Number of Clips to Play

The `-nN` switch specifies the total number of files to play. To play a clip just once, for instance, you specify `-n1`. To play it twice, use `-n2`. For a single playback of a playlist that contains 3 clips, for example, you specify `-n3`. A value such as `-n5` means to play the single clip five times, or to play the first five clips on the playlist (not to play each clip in the playlist five times). If you use `-n5` for a playlist that has just three clips, SLTA plays the three clips in order, then returns to the start of the list to play the first two clips again, for a total of five clips played.

Changing a Playlist During a Broadcast

When SLTA loops a playlist, either continuously (the default behavior) or a predetermined number of times because of the `-nN` option, it reads the playlist each time it starts a loop. This allows you to change the playlist during the broadcast. Simply edit the existing playlist, or replace the playlist with another of the same name. SLTA uses the modified playlist after it has played all of the clips in the current playlist.

> **Tip:** This feature lets you stream long broadcasts without writing a single, long playlist. Your first playlist might last an hour. During that hour of the broadcast, you can change the playlist to specify the clips that play during the second hour, and so on.

Using Shuffle Play

When you use a playlist, you can create shuffle play by including the `-r` option. If you use just this option without `-nN`, the playlist cycles continuously, playing clips in a random order during each cycle. You can use both the `-r` and `-nN` switches to cycle randomly through the playlist a certain number of times. For example, `-r` and `-n10` cause SLTA to transmit a playlist of five clips twice, with clips playing in a random order each time.

Disabling Title, Author, and Copyright Overrides

If you use the `-e` option, title, author, and copyright information included in the playlist is not used. RealOne Player still displays any title, author, and copyright information encoded in the clips, however. The `-f` option, which is the default, preserves all playlist overrides, which are described in "Adding Title, Author, and Copyright Information" on page 208.

Using TCP Transport

In basic mode, SLTA opens a UDP connection to Helix Universal Server unless you use the -t option to force a TCP connection. Although TCP provides a more reliable connection in a lossy environment, it increases the network overhead. In advanced mode, the -t option is not available because you specify TCP or UDP transport in the SLTA configuration file.

Synchronizing to a Wallclock

When you include the `-w` option, SLTA sets the first timestamp of the packet stream to the time defined by the clock on the SLTA computer. You can then use the SMIL wallclock timing feature to synchronize events in a SMIL presentation to specific times in the broadcast stream. For example, you might pop up an advertisement at 2:35 P.M. as recorded by the SLTA computer clock.

> **For More Information:** For information about the SMIL wallclock feature, see the advanced timing chapter of *RealNetworks Production Guide*.

Monitoring and Stopping SLTA

As SLTA runs, it displays the name of the file it is currently transmitting. A line of asterisks indicates the percentage of the file that has been sent. For example, a row of asterisks that lines up below the number `5` indicates that the file is approximately 50 percent complete. Here is an example:

```
Transmitting Welcome.rm...
0----1----2----3----4----5----6----7----8----9----10
**********************
```

SLTA stops automatically and displays the text `Done` when it has finished transmitting all of the files according to the playlist (if used) and the specified options. If it cannot transmit a file in a playlist because it cannot find the file, or the file is encoded in a format different from the preceding files, it skips that file, prints an error message, and transmits the next file.

Ordinarily, you will not need to stop SLTA manually except to halt the broadcast before it completes, or to terminate a continuously looping broadcast. To stop SLTA, press **Ctrl+c** at the command line from which you started SLTA on Windows. On UNIX, use the `kill` command with the process ID of the SLTA process.

Linking to the Simulated Live Broadcast

The following sections explain simulated live broadcast link formats in general, and provide example links for RealMedia broadcasts. For broadcasts in other formats, you need to use transmitter mount points and stream names as appropriate for that format.

Writing Basic Mode Links

Links to SLTA broadcasts in basic mode use the unicast URL formats described in "Linking to Unicasts" on page 134.

Linking from a Web Page

A Web page link to a RealMedia broadcast in which Helix Universal Server uses the default port 80 for HTTP might look like this:

```
http://helixserver.example.com/ramgen/broadcast/archive.rm
```

- The `/ramgen/` mount point launches RealOne Player, as explained in "Using a Client Launch Utility" on page 78. For a Windows Media broadcast, you use `/asxgen/`.
- The default broadcast mount point is `/broadcast/`, which you use for all media formats delivered by SLTA. If you are using redundant SLTA transmitters, use the `/redundant/` mount point instead. This default mount point can be changed as described in "Modifying Encoder Redundancy Settings" on page 123.
- The requested file, shown above as `archive.rm`, is the stream name you specify when starting SLTA. You do not use the actual name of the broadcasted clip or playlist.

Linking from a Ram or SMIL File

You can also launch a simulated, live RealMedia broadcast through a Ram file or SMIL file, as described in "Using Metafiles" on page 77. The URL format is similar to the preceding example, but it specifies RTSP or MMS, and omits the

/ramgen/ or /asxgen/ parameter. In the following example, the port number is omitted, which means that port 554 is used for RTSP:

```
rtsp://helixserver.example.com/broadcast/archive.rm
```

Creating Push Splitting Links

Links for advanced mode broadcasts use the same format as split broadcasts, which are described in "Linking to Split Content" on page 187. Push splitting links point to the Helix Universal Server receiver, but include the name of the SLTA transmitter to identify the broadcast.

Linking from a Web Page

A Web page link to a RealMedia broadcast in which Helix Universal Server uses the default port 80 for HTTP might look like this:

```
http://helixserver.example.com/ramgen/broadcast/Simulated/news/archive.rm
```

- The /ramgen/ mount point launches RealOne Player, as explained in "Using a Client Launch Utility" on page 78. For a Windows Media broadcast, you use /asxgen/.
- The default broadcast mount point is /broadcast/, but the Helix Universal Server receiver may define a different mount point. If you are using redundant SLTA transmitters, use the /redundant/ mount point instead. This default mount point can also be changed, as described in "Modifying Encoder Redundancy Settings" on page 123.
- Following the broadcast mount point, you specify the transmitter name, such as /Simulated/. The name is set in the SourceName variable of the configuration file, as explained in "Setting Basic Transmitter Properties" on page 201.
- A path name such as news/ is optional. You include it only if you've specified a value other than "*" for the PathPrefix variable in the configuration file. For more information, see "Directing Streams through Paths" on page 205.
- The requested file, shown above as archive.rm, is the stream name you specify when starting SLTA. You do not use the actual name of the broadcasted clip or playlist.

Linking from a Ram or SMIL File

You can also launch a simulated, live RealMedia broadcast through a Ram file or SMIL file, as described in "Using Metafiles" on page 77. The URL format is similar to the preceding example, but it specifies RTSP or MMS, and omits the /ramgen/ or /asxgen/ parameter. In the following example, the port number is omitted, which means that port 554 is used for RTSP:

```
rtsp://helixserver.example.com/broadcast/Simulated/news/archive.rm
```

Writing Pull Splitting Links

As with push splitting, a pull splitting link requests the stream from the receiver, and indicates the transmitter where the broadcast originates. The link does not use the transmitter name given in the SLTA configuration file, however. Instead, it provides the address and listen port of the transmitter so that the receiver can locate the transmitter and pull the broadcast stream.

Linking from a Web Page

A Web page link to a RealMedia broadcast in which the Helix Universal Server receiver uses the default port 80 for HTTP might look like this:

```
http://helixserver.example.com/ramgen/broadcast/pull/
simulator.example.com:2030/news/archive.rm
```

- The /ramgen/ mount point launches RealOne Player, as explained in "Using a Client Launch Utility" on page 78. For a Windows Media broadcast, you use /asxgen/.
- The default broadcast mount point is /broadcast/, but the Helix Universal Server receiver may define a different mount point. If you are using redundant SLTA transmitters, use the /redundant/ mount point instead. This default mount point can also be changed, as described in "Modifying Encoder Redundancy Settings" on page 123.
- Following the broadcast mount point, you specify the pull splitting mount point defined on the Helix Universal Server receiver, such as /pull/. The name is set in the receiver definition, as explained in "Enabling Pull Splitting Requests" on page 186.
- After the pull splitting mount point, you give the transmitter's address and listen port. The example above is /simulator.example.com:2030/. The SLTA configuration file defines the listen port, as described in "Setting Pull Configuration Values" on page 207.

Note: When broadcasting Windows Media, you need to mask the address and port through an alias, as described in "Using URL Aliases" on page 192.

- A path name such as `news/` is optional. You include it only if you've specified a value other than "/" for the `PathPrefix` variable in the configuration file. For more information, see "Setting Pull Configuration Values" on page 207.
- The requested file, shown above as `archive.rm`, is the stream name you specify when starting SLTA. You do not use the actual name of the broadcasted clip or playlist.

Linking from a Ram or SMIL File

You can also pull a RealMedia broadcast through a Ram file or SMIL file, as described in "Using Metafiles" on page 77. The URL format is similar to the preceding example, but it specifies RTSP or MMS, and omits the `/ramgen/` or `/asxgen/` parameter. In the following example, the receiver's RTSP port number is omitted, which means that port 554 is used for RTSP:

```
rtsp://helixserver.example.com/broadcast/pull/simulator.example.com:2030/
news/archive.rm
```

Note: When broadcasting Windows Media, you need to mask the address and port through an alias, as described in "Using URL Aliases" on page 192.

PART

V

SECURITY

The server administrator must ensure security for the network where Helix Universal Server resides, as well as consider the needs of media clients that may be behind restrictive firewalls. The following chapters help you handle these security issues.

CHAPTER

11

FIREWALLS

Firewalls may present communications problems to Helix Universal Server. This chapter helps you to find solutions to these problems. It first provides background on firewalls and network protocols. It then recommends ways to work with firewalls to give viewers the best possible streaming media experience. Finally, it lists the communications ports that RealNetworks components use.

> **Note:** You may also want to consult the firewall information on the RealNetworks technical support Web site at **http://www.service.real.com/firewall/**.

Understanding Firewalls

A firewall is a software program or device that monitors, and sometimes controls, all transmissions between an organization's internal network and the Internet. However large the network, a firewall is typically deployed on the network's edge to prevent inappropriate access to data behind the firewall. The firewall ensures that all communication in both directions conforms to an organization's security policy.

Firewall technologies are configurable. You can limit communication by direction, IP address, protocol, ports, or numerous other combinations. Firewalls positioned between your Helix Universal Server and other computers may cause communication failures if the firewall does not allow for the types of communication Helix Universal Server requires. These other computers may be media clients or servers set up as encoders or receivers.

If you have access to the firewall, you can configure it to enable the ports, protocols, and addresses that optimize Helix Universal Server communication. In some cases, however, your organization's security policy may prevent optimal streaming. For example, if a client is behind a firewall that permits only one-way, outbound access to the Internet, that client would not

efficiently receive clips streamed by Helix Universal Server over the Internet. This is because the client needs to establish a two-way connection to achieve optimal streaming results.

Protocol Layers

A protocol is a language that computers use when communicating over a network. The Transmission Control Protocol/Internet Protocol—commonly called TCP/IP—encompasses a suite of protocols upon which the Internet is built. TCP/IP protocols work on a layering principal, in which each layer is assigned a specific network task.

For communication to occur, a source computer sends a message from its highest network layer to its lowest. The lowest network layer at the source forwards the message over the network. When the message arrives at the destination computer, it must pass through the exact same layers, but in reverse order.

Each network layer uses specific protocols to perform its task. Packets passed down from upper layers are tucked inside lower layer packets. This is called *encapsulation*. By encapsulating packets, a layer can handle its responsibilities without understanding the preceding layer. Through this layering scheme, a destination layer on one computer receives exactly the same object sent by the corresponding source layer on another computer.

For example, an application such as a Web browser packages data, such as a Web page request made over HTTP, at the application layer, passing it to the lower transport layer. There, the HTTP request packets are bundled into TCP packets that are then delivered to destination Web server. When the Web server receives the source TCP packets, it strips off the TCP shells, and bumps the HTTP message up to the destination computer's application layer. This layer, in turn, delivers to the HTTP-based request to the Web server.

> **Note:** Network layering is a complex topic. This section omits discussion of additional layers required to deliver packets over a network, focusing instead on the transport and application layers, and the protocols relevant to streaming media for each.

Transport-Layer Protocols

All transport-layer protocols transfer data between hosts. The transport-layer protocol in use can greatly affect the quality of the stream received. There are

two main transport protocols used on IP networks: TCP and UDP. Helix Universal Server utilizes both of these protocols, and the choice of protocol is generally negotiated automatically by the servers and clients involved.

Transmission Control Protocol (TCP)

Helix Universal Server can use TCP in a number of ways. Because TCP offers a single channel for bi-directional communication, Helix Universal Server uses it as a control channel to communicate with clients about passwords and user commands such as pause and fast-forward. The TCP protocol also guarantees delivery of packets, and has built-in congestion control that helps to provide reliable communication.

On the down side, TCP responds slowly to changing network conditions, and creates network overhead through its error checking facility. For this reason, TCP is best suited for delivering low-bandwidth material like passwords or user commands. In some cases, TCP can facilitate communication through a firewall. For example, firewalls that block UDP traffic between Helix Universal Server and its clients may permit TCP connections.

User Datagram Protocol (UDP)

Helix Universal Server uses UDP packets to deliver data to client software on its data channel. Client software sends UDP-based requests to Helix Universal Server when packets on the data channel have not arrived. Because the transport does not consume as much network overhead, it can deliver packets faster than TCP.

Because video and audio data typically consume large amounts of bandwidth, it makes the most sense to use UDP to deliver streaming media. For this reason, Helix Universal Server uses UDP as the default for transmitter-to-receiver communication. With Helix Producer, you can set up the encoder to act as a transmitter. You therefore can, and should, use a UDP connection to deliver live feeds from the encoder.

Application-Layer Protocols

Helix Universal Server uses four application-layer protocols to deliver streaming media to clients: RTSP, PNA, MMS, and HTTP. The following table summarizes their use.

Application-Layer and Transport-Layer Protocols

Player Software	Application Protocol	Transport Options
RealOne Player, RealPlayer, QuickTime Player	RTSP	TCP and UDP, or TCP only
Windows Media Player	MMS	TCP and UDP, or TCP only
RealPlayer 5 and earlier	PNA	TCP and UDP, or TCP only
Windows Media Player, for streaming media and protocol roll-over	HTTP	TCP only
RealOne Player and RealPlayer, for HTTP cloaking	HTTP	TCP only

Real-Time Streaming Protocol (RTSP)

A standards-based protocol designed for serving multimedia presentations, RTSP is very useful for large-scale broadcasting. Only RTSP can deliver SureStream files with multiple bit-rate encoding. SMIL, RealText, and RealPix also require RTSP. RTSP uses TCP for player control messages, and UDP for video and audio data. RTSP can also use TCP to deliver data, but this is not recommended. Use RTSP with RTSP-compatible players such as RealOne Player, RealPlayer, and QuickTime Player.

Progressive Networks Audio (PNA)

PNA is a proprietary protocol used in earlier RealNetworks client software versions. PNA is supported in the current Helix Universal Server for compatibility with older RealNetworks clients (RealPlayer 5 and earlier). PNA uses TCP for player control messages, and UDP for audio data. PNA can also use TCP to deliver data, but this is not recommended.

> **Note:** The PNA protocol uses `pnm://` rather than `pna://` in the request URL.

Microsoft Media Services (MMS)

The MMS protocol is designed specifically for serving multimedia presentations. Although it is not standards-based, you can use it to broadcast live or on-demand Windows Media clips to Windows Media Player. MMS uses TCP for player control messages, and UDP for video and audio data. MMS can also use TCP to deliver data, but this is not recommended.

HyperText Transfer Protocol (HTTP)

HTTP is typically used for Web pages. With Helix Universal Server, HTTP is used to display Helix Administrator pages and HTML-based documentation. It is also used for requesting metafiles that point client software to streaming media content. HTTP may also be used in HTTP cloaking, which is a method of delivering streaming media to clients behind firewalls that restrict streaming media protocols.

Note: Helix Universal Server also uses HTTP to transport live Windows Media streams from Windows Media Encoder to Helix Universal Server.

Packet Formats

All Internet data is delivered in IP packets. But just as TCP or UDP can wrap a control protocol for streaming media, IP packets can wrap data packets in formats designed to deliver streaming media data. Helix Universal Server can use both of the following packet formats.

RealNetworks Data Transport (RDT)

When Helix Universal Server communicates to a RealNetworks client such as RealOne Player over RTSP, it uses RDT as the packet format. A proprietary format, RDT allows the use of RealMedia features such as SureStream.

Real-Time Transport Protocol (RTP)

RTP is a standards-based packet format designed as the companion to the RTSP protocol. QuickTime Player, for example, uses RTP as its packet format. Helix Universal Server fully supports RTP, and shifts to RTP automatically when streaming to an RTP-based client such as QuickTime Player. RealNetworks clients such as RealOne Player also support RTP, using this format when receiving data from RTSP/RTP servers.

Firewalls and Helix Universal Server Features

The following table describes how firewalls affect Helix Universal Server features.

Firewalls and Helix Universal Server Features

Feature	Effect of a Firewall
On-Demand Streaming	Issues that clients may have in connecting to on-demand streams are described in "Streaming to Client Software Behind Firewalls" on page 234.
Live Unicasting	Clients connect to live broadcasts in the same way they connect to on-demand streams. However, the encoder that supplies Helix Universal Server with its live data may not be able to connect to Helix Universal Server if a firewall exists between the encoder and Helix Universal Server. See "Working With An Encoder, Receiver, or Proxy" on page 233.
Splitting	Working with receivers that are located on the other side of a firewall requires special consideration. Chapter 9 covers this issue.
Multicasting	Multicasts usually take place within an intranet, where broadcasts are not travelling outside a firewall. If a multicast is occurring through a firewall, the firewall must be specially configured to allow multicast traffic.
Helix Universal Proxy	Helix Universal Proxy connects to your Helix Universal Server just as any other client would.
Access Control, and Reporting	When a firewall exists between a client and Helix Universal Server, the IP address that appears in the access log's *client_IP_address* field may not be the true client address, and you might not get an accurate idea of exactly which clients are viewing material streamed by your Helix Universal Server.
Authentication	Requests by Helix Universal Server for authentication information (either from the user or the client software) is delivered over the control channel. If a firewall prevents the control channel connection, Helix Universal Server cannot authenticate the request and therefore will not deliver it.
ISP Hosting	If there is a firewall between users and the location where they are to store their content for hosting, they may not be able to send their clips to Helix Universal Server.

Placing Helix Universal Server in a Network

One of the first decisions to make about deploying Helix Universal Server is where it should live on your network. If you are streaming content only to clients inside your organization, typically it is best to locate your Helix Universal Server inside the firewall. This requires no special configuration for Helix Universal Server or the firewall. Clients on the Internet side of the firewall, however, most likely will not be able to access your Helix Universal Server.

If you need to stream content to clients on the Internet, it's better not to locate Helix Universal Server behind a firewall. For optimal streaming, Helix Universal Server needs to use streaming protocols, and to process incoming and outgoing UDP connections on a variety of ports. Although you may be able to change your organization's security policy to enable optimal communication, this may hamper the effectiveness of the firewall.

The best solution may be to create a perimeter network, sometimes known as a *De-Militarized Zone* (DMZ), and move Helix Universal Server there. In this scenario, you fortify the connection between main and perimeter networks, but allow a less stringent security policy in the perimeter. This keeps the main network secure, while maintaining optimal connections from the Internet to your Helix Universal Server.

Working with Firewall Technologies

In some organizations, the only choice is to place Helix Universal Server behind the firewall, and then stream media through the firewall. If this is your situation, you must configure your firewall to enable optimal communication with Helix Universal Server and other computers. If not, communication may be substandard or even impossible.

The following sections describe the requirements for optimal communication in various situations. They will help you to decide what types of traffic to allow through your firewall. The section "Default Ports" on page 237 lists the specific ports that Helix Universal Server uses to communicate with other computers. Keep in mind that the values listed there are defaults, many of which can be changed to suit your needs.

Limiting Incoming UDP Traffic

Helix Universal Server enables you to limit the number of ports used for incoming UDP packets from clients such as RealOne Player. The client sends

these packets to acknowledge data reception, and to request a resend of lost packets. Although a firewall can accept all incoming UDP communication, network administrators often hesitate to leave open a large number of UDP ports. Service quality degrades, though, if Helix Universal Server cannot receive these packets. To solve this problem, Helix Universal Server can redirect replies from all clients to a few UDP ports, thus limiting the number of open UDP ports.

For More Information: For instructions on how to set up this feature, see "Changing Port Assignments" on page 60.

Working With A Virtual IP Address

Firewalls are not the only type of technology that can affect where you place Helix Universal Server. You might also need to place a cluster of Helix Universal Servers behind a virtual IP address. Although this network topology is possible, its implementation may have unintended consequences for RTSP traffic behind a restrictive firewall.

How Virtual IP Addressing Works

A typical IP address resolves to a single server. A virtual IP address, on the other hand, resolves to a cluster of servers, typically through a hardware switch. Consider the case of a cluster of servers set behind a hardware switch, with all servers sharing the same content, but configured with unique, private IP addresses. In this scenario, only the hardware switch is assigned a public IP address. It receives all public communication, passing each request to a host in the cluster, based on load.

The Problem with Virtual Addressing

A problem arises from the combination of public and private IP addresses. If a firewall blocks streaming media protocols, the client communicates through *HTTP cloaking*. In most cases, this effectively bypasses firewall security, which typically allows HTTP traffic to pass. The section "HTTP Cloaking" on page 235 discusses this strategy in detail. For now, it is important only to grasp that for cloaking to work, the client must be able to make *two* HTTP connections to the *same* Helix Universal Server.

When a client uses HTTP cloaking, Helix Universal Server replies to the initial HTTP connection with its actual IP address, and not the virtual IP of the cluster. This allows the client to circumvent the hardware switch, and establish its second HTTP connection directly with the Helix Universal Server handling

the request. But if that server uses a private IP address, the client cannot make the second, necessary connection, and HTTP cloaking fails.

Resolving the Virtual Addressing Problem

There are two ways to resolve the virtual addressing problem:

- Configure firewalls to allow connections by streaming media protocols. This is the ideal solution, because communication between server and clients will be the most efficient.
- Use globally routable IP addresses on all hosts behind a virtual IP address. This way, clients can make HTTP-cloaked requests behind firewalls that restrict streaming media protocols. This requires your organization to register for a larger number of public IP addresses, however.

If neither of these solutions is possible, some RTSP clients outside of highly restrictive firewalls may not be able to access your content.

Working With An Encoder, Receiver, or Proxy

Once you have placed Helix Universal Server in relation to your firewall, you need to consider the placement of other servers. These servers might be other Helix Universal Servers set up as receivers or relays, or they may be computers running encoding or media proxy software. Generally, the same rules and limitations discussed in the preceding sections apply to placing these types of servers as well. If possible, place other encoders or receivers in the perimeter network along with Helix Universal Server. If that's not possible, solutions depend largely on the type of server you're considering.

Communicating With Encoders

This section assumes that you've placed Helix Universal Server behind your firewall, and have taken steps to ensure optimal communication with encoders outside your firewall. Even if your firewall is optimally configured, another organization's firewall may cause problems.

Suppose that another organization broadcasts a live feed to your Helix Universal Server from behind their own restrictive firewall. The best solution is to contact that organization and have them move their encoder from behind the firewall. Alternatively, you could agree with that organization to open the required network paths. If neither of the preceding solutions is feasible, you can attempt an encoder connection using TCP.

HTTP Broadcasts from Windows Media Encoder

When Windows Media Encoder sends a live Windows Media broadcast, the only protocol option is HTTP, which uses TCP. In these cases, Helix Universal Server pulls the live feed from the encoder. Contact the administrator of the Windows Media Encoder for the HTTP port number to pull from. Helix Universal Server receives the live feed on its default HTTP port.

Communicating With Receivers

By default, receivers and Helix Universal Servers use UDP to communicate. An option is available for them to use TCP instead. If the receiver is behind a firewall, you should move the receiver to the perimeter network. If this is not possible, change the transport protocol used for transmitter-to-receiver communication to TCP as described in Chapter 9, "Transmitters and Receivers".

Communicating With Helix Universal Proxys

Helix Universal Proxy servers commonly work behind a firewall. In this respect, a Helix Universal Server-to-Helix Universal Proxy connection behaves like a Helix Universal Server-to-client connection, except for HTTP communication. Helix Universal Proxy first tries to connect with RTSP using UDP for data transport. If the firewall prohibits UDP connections, Helix Universal Proxy tries RTSP, using TCP for data transport. Helix Universal Proxy has no option for HTTP delivery. Thus, if the firewall prohibits RTSP, Helix Universal Proxy will not be able to proxy streams on behalf of clients.

Streaming to Client Software Behind Firewalls

This section describes how client technologies communicate to Helix Universal Server when the streaming media viewer resides behind a firewall. It provides suggestions for setting up Helix Universal Server to accommodate client connection features.

Channel Negotiation

Helix Universal Server uses two connections, known as *channels*, to communicate with clients:

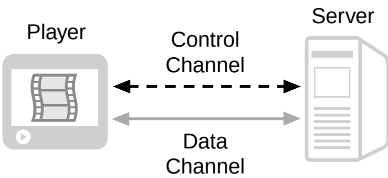
- control channel

Helix Universal Server uses this channel for communication with the client. Over this channel, Helix Universal Server requests and receives passwords, and clients send instructions such as fast-forward, pause, and stop.

- data channel

  The media clips themselves are streamed over a separate *data channel*.

Helix Universal Server Communication with RealOne Player



At the transport layer, most media players, including RealOne Player, can work around situations in which the first communication fails because the player resides behind a firewall that blocks the preferred protocol. The primary strategy involves shifting automatically to protocols and delivery methods that aren't blocked. Typically, the client shifts the control channel to the less efficient TCP, which is less likely to be blocked than UDP.

If the control connection is established, the client then negotiates the data channel. Optimally, the data channel will use the more efficient UDP transport. If the stream is live, some client software, including RealOne Player, attempts to set up a UDP multicast first. If this method fails, the client next attempts UDP unicast. And if that fails, the client uses the established control channel for data. In short, the client tries to set up the most optimal data delivery method, relying on the control connection as a last resort.

> **For More Information:** Unicasting and multicasting are described in Chapter 7 and Chapter 8, respectively.

HTTP Cloaking

Some firewalls restrict streaming media protocols like RTSP or MMS, and the client cannot establish the control connection. In these cases, the client and server disguise streaming media traffic as HTTP, a solution known as *HTTP cloaking*. Because most firewalls allow HTTP traffic, this solution circumvents the communication problem. However, HTTP is not designed for streaming media, and the user does not get the highest quality stream.

The HTTP cloaking method must also work around limitations in the HTTP protocol. For example, RTSP clients use two HTTP streams to connect to a single Helix Universal Server. Because the client initiates both streams, the client firewall typically allows these connections as outgoing HTTP traffic. The first connection uses the HTTP `GET` method, the standard means for a browser to request a Web page. At the receiving end, Helix Universal Server strips off the HTTP disguise, using the encapsulated RTSP information to determine what information to send the client.

Helix Universal Server must then wait for the second HTTP connection from the same client to proceed with streaming the media. This second connection uses the HTTP `POST` method, the standard means for a Web server to send data to a browser. Once both of these client-initiated streams are established, the client and Helix Universal Server can pass RTSP packets in two directions, through a firewall that blocks RTSP.

Port 80 For HTTP Traffic

For HTTP cloaking to work, the client must connect to Helix Universal Server's HTTP port. It has no problem if Helix Universal Server uses the well-known port 80 for HTTP. But problems can arise if Helix Universal Server uses a different HTTP port. Even if the client knows which port to use, the client will not be able to connect if its firewall restricts outgoing HTTP traffic to port 80.

For this reason, RealNetworks recommends setting the HTTP port on Helix Universal Server to port 80. This configuration offers the widest possible support of all types of player software. If this is not possible, RealOne Player and RealPlayer 8 can often discover the Helix Universal Server HTTP port, and will be able to connect to the HTTP port as long as a firewall does not block their outbound communication. Not all players can do this, however.

> **For More Information:** When you install Helix Universal Server and a Web server on the same machine, you need to take certain precautions before assigning port 80 to Helix Universal Server. For more information, see "Web Servers and Helix Universal Server" on page 35.

Port Hinting

Port hinting offers a solution for Helix Universal Servers that cannot use default port values. It allows Helix Universal Server to send the port numbers in use to RealOne Player and RealPlayer 8 when you launch clips using the

Ramgen utility. This feature is turned on by default. Content creators can also define ports to try on the Helix Universal Server machine when defining Ram files.

For More Information: See "Handling Communication through Nonstandard Ports" on page 61 for more information about these features.

Default Ports

The following section will help you to decide which ports to open on your firewall. If you do not want to open all the ports listed, refer to the detailed information at **http://service.real.com/firewall/**.

Helix Universal Server Default Ports

The following tables list the default ports that Helix Universal Server uses to communicate with media clients and other server.

Helix Universal Server Ports for Communicating with Media Players

Activity	Port Number	Transport	Purpose
listen on	554	TCP	control channel for RTSP requests (data channel also, if TCP was requested)
listen on	7070	TCP	control channel for PNA requests (data channel also, if TCP was requested)
listen on	HTTP Port	TCP	HTTP requests, and RTSP, MMS and PNA cloaked through HTTP
listen on	1755	TCP, UDP	TCP control channel for MMS requests (data channel also, if TCP was requested); UDP resend requests by MMS
listen on	34445-34459	UDP	RDT/RTP client replies for UDP resends, etc.
send to	1024-5000	UDP	MMS media packet delivery
send to	1-65000	Multicast	MMS multicast media packet delivery
send to	6970-32000	UDP	data channel

Helix Universal Server Ports for Communication with Helix Administrator

Activity	Port Number	Transport	Purpose
listen on	Admin Port	TCP	connections to Helix Administrator
listen on	9090	TCP	Server Monitor traffic

Helix Universal Server Ports for Communication with Content Caching Subscribers

Activity	Port Number	Transport	Purpose
listen on	554	TCP	media distribution requests

Helix Universal Server Ports for Communication with License Subscribers

Activity	Port Number	Transport	Purpose
listen on	Admin Port	TCP	license subscriber initiation request
listen on	4321	TCP	license distribution accounting channel

Helix Universal Server Ports for Communication with Receivers

Activity	Port Number	Transport	Purpose
listen on	2030	TCP or UDP	data channel for pull splitting requests
send to	30001 -30020	TCP or UDP	live data distribution

Helix Universal Server Ports for Communication with Encoders

Activity	Port Number	Transport	Purpose
listen on	4040	TCP	control channel for RealProducer version 6 and 6.1 connections
listen on	6970-32000	UDP	data channel for RealProducer 6 and 6.1
listen on	4040	TCP	data channel for RealProducer 6.1 connections, if TCP was selected
listen on	5050	TCP	control channel for pre-G2 encoder connections
listen on	50001-50050	TCP or UDP	media packet reception from Helix Producer 9 in account-based transmitter mode

(Table Page 1 of 2)

Helix Universal Server Ports for Communication with Encoders (continued)

Activity	Port Number	Transport	Purpose
listen on	HTTP Port	TCP	negotiate transmitter settings for Helix Producer 9 in account-based transmitter mode
listen on	HTTP port	TCP	HTTP connection to Windows Media Encoder (Helix Universal Server pulls the stream)

(Table Page 2 of 2)

Helix Universal Server Ports for Communication with Helix Universal Proxy

Activity	Port Number	Transport	Purpose
listen on	554	TCP	control channel for RTSP requests to Helix Universal Server
listen on	554	TCP or UDP	Helix Universal Proxy live requests
listen on	554	TCP	Helix Universal Proxy cache requests

Receiver Default Ports

In addition to the values shown in the follow table, a receiver will use all the values described in "Helix Universal Server Default Ports" on page 237 if it is also serving its own content (separate from splitting).

Receiver Ports for Communication with Helix Universal Server

Activity	Port Number	Protocol	Purpose
listen on	554	TCP	RTSP requests from RealOne Player
send to	2030	TCP or UDP	pull splitting requests
listen on	30001 -30020	TCP or UDP	push splitting requests

Helix Universal Proxy Default Ports

The following tables list the default ports used by Helix Universal Proxy.

Helix Universal Proxy Ports for Communication with RealOne Player

Activity	Port Number	Protocol	Purpose
listen on	7070	TCP	PNA proxy requests

(Table Page 1 of 2)

Helix Universal Proxy Ports for Communication with RealOne Player (continued)

Activity	Port Number	Protocol	Purpose
listen on	554	TCP	RTSP proxy requests
send to	6970-32000	UDP	data channel

(Table Page 2 of 2)

Helix Universal Proxy Ports for Communication with Helix Universal Server

Activity	Port Number	Protocol	Purpose
send to	554	TCP	control channel for RTSP requests
send to	3030	TCP or UDP	data and control channel for pull splitting requests
send to	7070	TCP	control channel for PNA requests
send to	7802	TCP	cache requests to Helix Universal Server
send to	7878	TCP	cache requests to Helix Universal Server

Helix Universal Proxy Ports for Communication with Helix Administrator

Activity	Port Number	Protocol	Purpose
send to	9090	TCP	Server Monitor traffic
listen on	Admin Port	TCP	Helix Administrator

Encoder Default Ports

With Helix Producer 9, you can set up the encoder to function in different ways. The two Helix Producer methods of communicating documented in the following tables are legacy mode and account-based transmitter mode. When Helix Producer uses newer encoding methods, it imitates a transmitter. If you have set up Helix Producer to function this way, use the ports and protocols listed in "Helix Universal Server Default Ports" on page 237.

Helix Producer 9 Ports for Account-Based Transmitter Mode

Activity	Port Number	Protocol	Purpose
listen on	80	HTTP	Helix Producer initiation requests in account-based mode
send to	50001-50050	TCP or UDP	media packet reception from Helix Producer in account-based mode

In RealProducer G2 (version 6) and later, you can instruct RealProducer to use TCP for the data connection. UDP is the preferred method, as it results in a better user experience, but TCP may be necessary if there is a firewall between the encoder and the Helix Universal Server. If you do opt to use TCP, port 4040 will be used for both the control channel and the data channel.

RealProducer Ports for Communication in Legacy Mode

Activity	Port Number	Protocol	Purpose
send to	4040	TCP	control channel
send to	6970-32000	UDP	data channel if UDP is selected for the Helix Universal Server connection (the actual port number is not configurable)
send to	4040	TCP	data channel if TCP is selected for the Helix Universal Server connection

Note: RealProducer 5 and earlier use a TCP data and control channel sent on port 5050.

Media Player Default Ports

The following table lists the communications ports used by RealOne Player, RealPlayer 6-8, Windows Media Player, and QuickTime Player. In addition to the settings listed below, RealOne Player inherits proxy settings (if they exist) from the default browser, although users can turn off this feature from the RealOne Player **Preferences** menu.

When Helix Universal Server receives a control channel request, it directs the data to the port number specified by the client. RealOne Player and RealPlayer choose UDP for the data channel, and indicate a data channel port number between 6970 and 32000. Windows Media Player also chooses UDP, and indicates a data channel port number between 1024-5000. If the client chooses

TCP for the data channel, Helix Universal Server uses the same port number for both the control channel and the data channel.

Media Player Ports for Communication with Helix Universal Server or Helix Universal Proxy

Activity	Port Number	Protocol	Purpose
send to	554	TCP	control channel for RTSP requests (data channel also, if TCP was requested)
send to	7070	TCP	control channel for PNA requests (data channel also, if TCP was requested)
send to	HTTP Port	TCP	HTTP requests, and RTSP, MMS and PNA cloaked with HTTP
send to	1755	TCP, UDP	TCP control channel for MMS requests (data channel also, if TCP was requested); UDP resend requests by MMS
send to	34445-34459	UDP	RDT/RTP UDP resend requests
listen on	1024-5000	UDP	MMS media packet delivery
listen on	1-65000	Multicast	MMS multicast media packet delivery
listen on	6970-32000	UDP	data channel

Versions of RealPlayer earlier than RealPlayer G2, use the following ports.

RealPlayer versions 3 through 5 Communication Ports

Activity	Port Number	Protocol	Purpose
send to	7070	TCP	control channel for PNA requests; data channel, if TCP was requested
send to	80	TCP	control channel; data channel, if HTTP cloaking or HTTP streaming is used
listen on	6970 - 6999	UDP	data channel (not configurable)

CHAPTER

12

ACCESS CONTROL

Using the access control feature, you can block requests to Helix Universal Server by media clients, encoding software, and other servers, based on the IP address of the requesting machine and the Helix Universal Server port to which the request is made. This chapter explains how to set up access control rules.

Note: To implement user name and password control for media clients, refer to Chapter 13. The section "Controlling Connections" on page 64 explains how to limit connections according to outgoing bandwidth use, total number of players, and other general criteria.

Understanding Access Control

The access control feature associates permission to connect to certain ports with client addresses. For example, you can allow only certain groups in your organization to view clips by giving those groups' IP addresses access to application protocol ports on Helix Universal Server. If a media player requests a clip through a port for which it has no access, it receives a message that the URL is invalid, or that the connection has timed out.

Rule Components

Helix Universal Server uses rules to implement access control policy. Each access rule provides the following information:

- **Sorting Order**—Order in which a rule is implemented. Helix Universal Server implements access rules in order, from the first to the last. This is important to keep in mind when establishing the order in which you wish your rules to apply.
- **Access**—Whether the client is allowed or denied access.

- **Client IP Address**—Client's address, or a range of addresses. This can also be an encoder's IP address.
- **Server IP Address**—Helix Universal Server's address.
- **Ports**—Port numbers on Helix Universal Server to which access is allowed or denied. For general content viewing, these numbers correspond to the RTSP, PNA, HTTP, and MMS ports. For encoders, these correspond to the port numbers in the broadcasting setup pages.

Predefined Access Rules

Helix Universal Server predefines two access rules:

- `Allow all localhost connections`—This rule permits access to Helix Universal Server from an application running on the same computer. You should not edit this rule. This rule should always come first in the access control list.
- `Allow all other connections`—This rule allows all clients to make any request on any port. Access is denied, though, if the content is secured, and the client does not supply a valid user name and password.

By default, the second rule allows all clients to make requests on all ports. Hence, access control checking is off. To turn access control on, you need to delete or modify the second rule, and implement new rules.

Access to Helix Administrator

When you implement access control, you may inadvertently lock yourself out of Helix Administrator by denying all client access to the Admin port. Therefore, if you decide to set up access control, the first rule to define should allow access to the Admin Port. This rule needs to come directly after the predefined `Allow all localhost connections` rule. The section "Granting Access to Helix Administrator" on page 245 explains how to create this rule.

Access Rule Methods

To use the access control feature, you must make decisions about the types of rules you will create. Then, you can create as many rules as you need. There are two general methods that you can use to restrict access to Helix Universal Server:

- specific address denial

  In this method, you deny access to a specific group of IP addresses and ports, and allow access to everyone else. This is the better policy if you want to block a small number of clients, while allowing most clients to make requests.

- specific address permission

  This method is the opposite of the preceding. Here, you allow access to a specific group of IP addresses and ports, and deny access to everyone else. This is the better policy if you want to block a large number of clients, allowing only a small number of clients to make requests.

When you create a rule, you select a specific client IP address. Optionally, you can extend the addressing by choosing a bit mask, as described in Appendix B. You then select the ports for which that set of clients is allowed or denied access. You may need only one access rule. Or, you may want to set up several.

Rule Order

When you create multiple access rules, you need to set a rule order using the up and down arrow buttons on the rule list. Helix Universal Server carries out rules in order from first to last. When a client connects, Helix Universal Server evaluates the connection starting with the first rule on the list. As soon as it finds a rule that matches the player's address, it allows or denies access according to that rule.

> **Tip:** When implementing an access control policy, make the rules at the top of the list more strict. Reserve lower positions for the more lenient rules.

Granting Access to Helix Administrator

If you decide to implement access control rules, the first step is to set up a rule that enables you to connect to Helix Administrator, regardless of the restrictions you create in other rules.

➤ To grant access to Helix Administrator:

1. If you do not know the Admin port number, click **Server Setup>Ports**. Or, click the **View** link at the bottom of the Access Control page. Note the value of the **Admin Port** field.

2. Click **Security>Access Control.**
3. Click the "+" icon in the **Access Rules** section.
4. In the **Edit Rule Description** box, enter a rule description such as `AccessToAdmin`.
5. In the **Access Type** pull-down list, select `Allow`.
6. In the **Client IP Address or Hostname** box, type `Any`. Although this appears to allow everyone access to Helix Administrator, administrator log-in is guarded by the randomly-generated Admin port number, as well as user name and password validation, as described in "Administrator Authentication" on page 250.

   > **Tip:** For additional security, specify the IP address for users permitted to using an address and a bit mask.

7. If you specified a client IP address, you can indicate a range of allowable addresses by selecting a bit mask from the **Client Netmask** pull-down list. For information on using a bit mask, see Appendix B.
8. In the **Server IP Address** box, type `Any`.
9. In the **Ports** box, enter the Admin port number.
10. In the **Access Rules** area, click the up arrow to place `AccessToAdmin` as the second rule on the list, following the first predefined rule (`Allow all localhost connections`).
11. Click **Apply**.
12. Restart Helix Universal Server.

Creating General Access Rules

Follow the steps in this section to allow or deny access to specific client IP addresses or address ranges.

> **Warning!** Be sure first to follow the steps in "Granting Access to Helix Administrator" on page 245, or you may not be able to access Helix Administrator after you implement your access rules.

➤ To limit client access requests by IP address:

1. Review the ports in use for PNA (usually 7070), RTSP (usually 554), and MMS (usually 1755). You'll need these numbers for Step 8. You can determine the port values by clicking **Server Setup>Ports**. Or, click the **View** link at the bottom of the Access Control page.
2. Click **Security>Access Control**.
3. Click the "+" icon and enter a short description for the new access rule in the **Edit Rule Description** box. This description is for your reference only.
4. From the **Access Type** list, indicate whether permission is to be granted or refused by selecting `Allow` or `Deny`.
5. In the **Client IP Address or Hostname** box, type the IP address of the client machine. To refer to all clients regardless of IP address, enter `Any` and leave the **Client Netmask** box set to `None`.
6. To indicate a range of client IP addresses, select a bit mask from the **Client Netmask** pull-down list. For information on using a bit mask, see Appendix B.
7. In the **Server IP Address or Hostname** box, type the IP address or host name of Helix Universal Server. You can type a specific address, or use the word `Any` to refer to any IP address Helix Universal Server uses to listen for incoming requests.

    Note: If you type a specific IP address or host name rather than `Any`, ensure that the address is on the IP binding list. See "Binding to an IP Address" on page 62 for more information.

8. List the Helix Universal Server port numbers to which you want to restrict access. In the **Ports** box, type the port numbers you noted in Step 1, separating entries with commas. For example, type:

    ```
    1090, 554
    ```

9. In the **Access Rules** area, click the up arrow or down arrow to move the rule to its appropriate position on the list. General access rules should always come after the `Allow all localhost connections` rule, and the rule you created for allowing access to Helix Administrator. For more information, see "Rule Order" on page 245.
10. Click **Apply**.

11. Restart Helix Universal Server.

CHAPTER

13

AUTHENTICATION

Helix Universal Server authentication provides a way to control what or who can access your Helix Universal Server, whether an encoder sending a broadcast stream, a colleague perusing Helix Administrator, or a user viewing paid content. This chapter explains how to set up user name and password authentication, as well as validation through media player IDs.

> **Note:** Chapter 12 describes how to limit access to media based on media players' IP addresses. The section "Controlling Connections" on page 64 explains how to limit connections according to outgoing bandwidth use, total number of players, and other general criteria.

Understanding Authentication

Authentication verifies the identity of the users or software programs that make requests of Helix Universal Server. It usually takes the form of user name and password validation, though this is not necessary in all cases. The following sections describe the major authentication features and components.

Types of Authentication

There are several types access requests that you can authenticate, such as viewers requesting media, or Helix Universal Server users logging into Helix Administrator.

Media Viewer Validation

The most common use of authentication is to validate viewer access to on-demand clips or broadcasts. Helix Universal Server can require a standard user name and password combination that the viewer enters when requesting

secure content. Or, you can have viewers register their players' globally unique identifiers (GUIDs). Helix Universal Server then validates access requests automatically, without asking viewers for user names and passwords.

The following table lists supported media players and the types of authentication that you can use with them. `Basic`, `RealSystem 5.0`, and `Windows NT LAN Manager` are forms of user name and password validation, as described in "Authentication Protocols" on page 265.

Media Players and Supported Authentication Types

Media Player	Basic	RealSystem 5.0	Windows NT LAN Manager	player GUID
RealPlayer 3 and earlier	no	no	no	no
RealPlayer 4	no	no	no	**yes**
RealPlayer 5 and higher	**yes**	**yes**	**yes**	**yes**
Windows Media Player	no	no	no	no
QuickTime Player	**yes**	no	no	no
Any other RTP-based player	no	no	no	no

For More Information: See the section "Setting Up Basic Media Authentication" on page 255 for the basics of user name and password authentication. "Validating Media Player IDs" on page 276 explains validation through player GUIDs.

Administrator Authentication

Accessing Helix Administrator requires a valid user name and password. As explained in "Starting Helix Administrator" on page 47, the URL used to access Helix Administrator contains the `/admin/` mount point, which automatically authenticates the login. The installation process creates the initial user name and password pair, but you can add additional user names and passwords to the `SecureAdmin` realm, as described in "Managing Users and Passwords" on page 258.

Encoder Validation

User name and password authentication for live or simulated live streams sent to Helix Universal Server is generally required for these encoders:

- Helix Producer 9 running in account-based mode. See "Setting Up Account-Based Broadcasting" on page 126 for information about this broadcast mode.
- RealProducer G2 through 8.5. The section "Encoding with an Older Version of RealProducer" on page 128
- SLTA running in basic mode. For more information, see "Basic Mode Configuration" on page 195.

Although these encoders can use the main user name and password you use to log into Helix Administrator, RealNetworks recommends that you add additional user name and password pairs to the `SecureEncoder` realm for each live broadcast encoder. See "Managing Users and Passwords" on page 258 for more information.

Password Validation Not Part of the Authentication System

Communication between the following components and Helix Universal Server typically require password validation:

- Helix Producer 9 running in push or pull mode.
- SLTA running in advanced mode.
- Transmitters and receivers in splitting arrangements.
- Third-party media encoders.

This validation is *not* performed by the authentication system, however. Generally, the required passwords are defined on the encoder in its interface or configuration file. On Helix Universal Server, you use Helix Administrator to set up the passwords, which are stored in the configuration file.

Content Caching Subscriber Authentication

Content caching subscriber authentication is initiated by the content caching file system when making a request to the publisher server from the subscriber server. Like administrator and encoder authentication, the user name and password you enter during setup is also the default user name and password required for content caching subscribers. You can add additional user name and password pairs to the `SecureCDist` realm, as described in "Managing Users and Passwords" on page 258.

> **For More Information:** The subscriber server sends the authentication user name and password with its request for

content. For more information, see “Setting up Content Caching Subscribers” on page 100.

Authentication Components

As you set up authentication, you work with several components. Databases store privileges. Realms validate user names and passwords. Commerce rules determine which on-demand clips and live broadcasts are secure. And permissions grant access to content on a user-by-user basis.

Databases

On each authentication request, Helix Universal Server verifies the user’s password and permissions in a database. Helix Universal Server installs a number of flat file databases, as described in “Using Databases” on page 262. It uses different databases for different types of authentication. One database holds permissions for media players, for example, while another verifies the identity of encoders that deliver live broadcast streams.

To implement authentication on a limited scale (a few hundred users, for example), use the predefined flat file databases. This requires no additional database configuration. For large-scale implementations of authentication, however, you can tie Helix Universal Server’s authentication system to an ODBC-compliant or mSQL relational database. On Windows NT systems, you can also tie authentication into an existing LAN manager database.

For More Information: For more about databases, see “Using Databases” on page 262. Appendix C explains the database structure, which you’ll need to know to use a relational database for authentication. See also “Windows NT LAN Manager” on page 266.

Realms

An authentication realm indicates the database that stores a user’s name and password, and specifies the authentication protocol used to validate the user’s identity. An authentication protocol, which is not related to streaming protocols such as RTSP, determines how passwords are encrypted in the database. You can use a basic encryption protocol, or a more secure protocol that works with RealNetworks media players only.

Tip: Helix Universal Server predefines several realms. Depending on your authentication needs, you may not need to

change or add realms. For more on realms, see “Setting Up Realms” on page 264.

Commerce Rules

Commerce rules determine which on-demand clips or live broadcasts require authentication. Helix Universal Server predefines a set of commerce rules, each rule creating a *protected path* that leads to secure content. One rule protects all on-demand clips residing in the default security directory, for example. You can set up additional commerce rules as needed. For example, you’ll need to create a new commerce rule, or modify an existing one, to secure clips that reside on a network drive.

Note: Commerce rules work only for media access, and do not apply to other forms of authentication, such as encoder validation. For more information, see “Defining Commerce Rules” on page 267.

Permissions

Permissions attach to commerce rules to govern which users can view which clips or broadcasts. Using permissions, you can grant different users access to different secured clips. You can also grant viewing access that expires at a certain date and time, for example, or that is limited to a total amount of time. Although permissions are enforced by default, you can turn them off to give all authenticated users unlimited access to the content protected by a commerce rule. When you turn off permissions for on-demand content, for instance, all authenticated users have unlimited access to all secured, on-demand clips.

For More Information: For specifics about the permissions that you can grant, see “Handling User Permissions” on page 270.

Authentication Used with Other Features

Authentication works with all other Helix Universal Server features. There are few special considerations for each feature, however.

Authentication Used with Other Features

Other Feature	Notes
On-Demand Streaming	All on-demand files stored in the Secure directory (or in any subdirectories) are authenticated automatically, once the authentication feature has been set up.
Live Unicasting	Once the authentication feature has been set up, live broadcasts are authenticated automatically if they include /secure/ as part of the path when you encode the events.
Archiving	Archived files are on-demand files that can be authenticated if they are moved to the correct location. They must be placed in the Secure directory or in a subdirectory of Secure, or the archiving feature must be configured to use the Secure directory.
SLTA	Just like any other live event, broadcasts created by SLTA can be authenticated, as long as you include /secure/ in the broadcast path.
Splitting	If you are sending a stream to a Helix Universal Server that is acting as a receiver, you must put copies of all the databases that store authentication information on the receiver. This distributes the authentication load.
Multicasting	In back-channel multicasts, the user or client is authenticated through the initial control channel connection. Be sure the multicast (/) path is on the list of commerce rules. Authentication does not function with scalable multicasts.
Helix Universal Proxy	Helix Universal Proxy makes requests on behalf of clients, and caches the streams it receives. Although Helix Universal Proxy stores the streamed data, it requires a control channel between the requesting client and Helix Universal Server. Helix Universal Server uses the control channel to request and receive authentication information.
Firewalls	Authentication is performed over the two-way control channel. As long as the client can establish a connection through the firewall to Helix Universal Server, all material can be authenticated for clients behind firewalls.

(Table Page 1 of 2)

Authentication Used with Other Features (continued)

Other Feature	Notes
Access Control	Access control verification, which checks the client's IP address against a list of allowed addresses, occurs before authentication. So if a client's IP address is blocked, authentication will not take place. If users who should be able to view secure material receive error messages, check the list of access rules to see if their client addresses are disallowed.
ISP Hosting	Authentication of content cannot be applied to the files of ISP-hosted customers. Their material is always available. Depending on the access needs, you may be able to apply access control rules so that customers can allow or deny certain users' access to content.
Monitoring	You can monitor which secure presentations are in use by viewing the paths of the files in Server Monitor. Those that contain the `/secure/` mount point are authenticated.
Reporting	Efforts to authenticate users are not included in the access log; records are created for successful serves. You can identify authenticated material in the access log by the `GET` statement. Secure material always contains the `/secure/` mount point in the path. In addition, connection attempts for authenticated material are stored in the `accesslog.txt` file in the `Logs` directory of appropriate data storage directory (if you are using the text file method), or in the `Access_log` table (if you are using the database method).

(Table Page 2 of 2)

Setting Up Basic Media Authentication

The following sections explain the basics of how to secure on-demand clips and broadcasts through user name and password validation. They explain where to place clips, how to secure a broadcast originating from an encoder, and how to write URLs to the secure content. When you use the Helix Universal Server default settings, there are two setup steps you need to perform through Helix Administrator to implement user name and password checking:

1. Add user name and password combinations according to the instructions in "Managing Users and Passwords" on page 258.
2. Define user permissions (or turn them off), as described in "Handling User Permissions" on page 270.

In some cases, you may need to change certain default settings for databases and realms, depending on your authentication needs:

- If you are not using one of the predefined flat-file databases for storing passwords, you need to set up your database first, as described in "Using Databases" on page 262.
- When you create a new database, you must associate a new or existing realm with it, as described in "Setting Up Realms" on page 264.
- To validate access attempts from QuickTime Player, set the `Basic` authentication protocol in your authentication realms. For instructions on doing this, see "Creating or Modifying a Realm" on page 266.
- If you want to validate media player requests based on each player's ID, rather than on the users' names and passwords, refer to the instructions in "Validating Media Player IDs" on page 276.

Securing On-Demand Content

To require user name and password validation, you place clips in Helix Universal Server's `Secure` directory instead of in its `Content` directory. In a default installation on Windows, the `Secure` directory is here:

`C:\Program Files\Real\Helix Server\Secure`

Installation paths vary on UNIX, but the `Secure` directory is under the main installation directory, as in this example:

`/usr/local/Real/HelixServer/Secure`

Helix Universal Server identifies requests for secure, on-demand clips through a `/secure/` mount point that precedes the clip name in the request URL. This mount point is created during installation, and automatically requires authentication for all content in the `Secure` directory. The following is an example of a Web page URL to a secure clip:

`http://helixserver.example.com/ramgen`**`/secure/`**`video1.rm`

> **For More Information:** See "Writing Links to Content" on page 73 for background on link formats, mount points, and URLs used in Ram files.

Adding Subdirectories to Implement Permissions

You may want to create subdirectories within the `Secure` directory, then set up permissions as described in "Handling User Permissions" on page 270 to

define exactly which viewers can access which clips in which subdirectories. In this case, the request URL includes the subdirectory path, which can be any number of levels deep, after the `/secure/` mount point:

`http://helixserver.example.com/ramgen`**`/secure/dailyvideo/`**`video1.rm`

Placing Secure Clips in Other Directories

You can store secure, on-demand clips in directories other than the default `Secure` directory. This allows you to store secured clips on other drives or network machines. To do this, you define a new, secure mount point used in place of the default `/secure/` mount point.

➤ **To create a new security mount point for on-demand clips:**

1. Create a directory on your Helix Universal Server machine or your network to store your secure clips. This directory must not be a subdirectory of the existing `Content` or `Secure` directory.
2. Add a new mount point, such as `/secure2/`, that points to the new directory. For instructions on doing this, see “Adding a Mount Point for On-Demand Clips” on page 83.
3. Follow the instructions in “Adding or Modifying Commerce Rules” on page 269 to create a commerce rule that provides access to this new protected path.
4. Set up permissions for individual users to view content in the new protected path, as described in “Handling User Permissions” on page 270.

As shown in the following example, a URL to a clip in the new secure directory uses the mount point you define:

`http://helixserver.example.com/ramgen`**`/secure2/`**`video1.rm`

When Helix Universal Server receives a request to this protected path, it initiates authentication to verify that the user or player exists in the proper database according to the commerce rule that protects the `/secure2/` path.

Securing Broadcasts

To secure a live or simulated live broadcast, you include the `/secure/` mount point after the broadcast mount point in the request URL:

`http://helixserver.example.com/ramgen/broadcast`**`/secure/`**`live.rm`

Live or simulated live broadcasts do not correspond to actual files on Helix Universal Server. When a broadcast mount point such as `/broadcast/`,

/encoder/, or /live/ precedes the /secure/ mount point, Helix Universal Server performs authentication, but does not search for a file in its Secure directory. Instead, it delivers the live stream associated with the broadcast mount point.

Specifying the Secure Path on the Encoder

The encoder that delivers the live or simulated live stream must include the /secure/ virtual path along with the broadcast file name to indicate that this stream requires authentication. In Helix Producer, for example, you specify the live stream as secure/live.rm instead of just live.rm.

For More Information: Predefined commerce rules govern access to broadcasts from different encoders. For more information, see “Default Commerce Rules” on page 268.

Managing Users and Passwords

The following sections explain how to manage the user names and passwords of authorized users for any type of authentication, whether individuals requesting secured clips, encoders connecting with live streams, or additional users of Helix Administrator.

Note: If you are using Windows NT/2000/XP to manage the list of users, passwords, and groups, use those tools instead of the instructions below. To use Windows passwords, you need to set the NTLM authentication protocol in your selected realm, as described in “Creating or Modifying a Realm” on page 266.

Adding a User

Follow the procedure below to add a user and password to an authentication realm. To use a database other than one that is predefined, you must create that database and associate it with the proper realm before adding users. Refer to “Using Databases” on page 262 and “Setting Up Realms” on page 264 for more information.

Note: The Helix Administrator interface does not provide a way to add multiple user names and passwords at one time.

➤ To add a user name and password:

1. Click **Security>Authentication**.
2. In the **Authentication Realms** list, select the realm to which you want to add a user. The following realms are predefined:

`SecureAdmin`	Helix Administrator users
`SecureCDist`	content caching subscribers
`SecureContent`	media player users
`SecureEncoder`	RealProducer G2 through 8.5 delivering live broadcast streams
`SecureRBSEncoder`	Helix Producer delivering live broadcast streams, and SLTA delivering simulated live streams in basic mode

For More Information: Realms are described in "Setting Up Realms" on page 264.

3. Click **Add a User to Realm**.
4. In the pop-up window, define the user's name in the **Name** box. User names are case-sensitive. You can use separate words if, for example, you want to use full names of users.
5. In the **Password** box, supply the user's password. Passwords are case-sensitive. RealNetworks recommends following good password practices:
   - Avoid common words that are easy to guess.
   - Do not use a word associated with the user, such as a first name.
   - Do not use the same password for multiple users.
   - For highest security, use a random combination of letters and numbers in different cases.

   Tip: Keep track of the passwords you assign. Helix Administrator allows you to change passwords, but not to look them up.

6. In the **Confirm Password** box, type the password again.
7. Click **OK**.

Deleting a User

The following procedure explains how to delete a user from a database. Helix Administrator does not have a bulk delete feature.

➤ To remove a user:

1. Click **Security>Authentication**.
2. In the **Authentication Realms** list, select the name of the realm in which you want to delete a user. The predefined realms are described in “Setting Up Realms” on page 264.
3. Click **Remove a User from Realm**.
4. In the new window that appears, enter the user’s name in the **Name** box.
5. Click **OK**.

Browsing All User Names

The browsing feature lists all user names defined for an authentication realm.

➤ To browse all users:

1. Click **Security>Authentication**.
2. In the **Authentication Realms** list, select the realm you want to browse. The default realms are described in “Setting Up Realms” on page 264.
3. Click **Browse Users in Realm**. The pop-up window lists all user names defined for that realm.

Changing a Password

The following procedure explains how to change the password for an existing user. The Helix Administrator interface does not allow you to look up existing passwords.

➤ To change a password:

1. Click **Security>Authentication**.
2. In the **Authentication Realms** list, select the name of the realm that contains the user. The predefined realms are described in “Setting Up Realms” on page 264.
3. Click **Change User Password**.

4. In the new window that appears, enter the user's name in the **Name** box.
5. In the **Password** box, specify the user's new password.
6. In the **Confirm Password** box, type the password again.
7. Click **OK**.

Using the Password Tool

When it uses the RealSystem 5.0 authentication protocol, Helix Universal Server encrypts passwords, so you cannot look up the passwords directly. However, you can add or change passwords in a flat file or relational database by using a command-line utility. You can even create a password interface by integrating this utility with your own CGI scripts and Web pages.

For More Information: See "Authentication Protocols" on page 265.

➤ **To use the password tool:**

1. Open a command prompt and navigate to the `Bin` directory under Helix Universal Server's main installation directory.
2. Enter the following command:

   `mkpnpass` *`username realm`*

   using the following values:

username	The user name exactly as it is entered, or will be entered, in the authentication database.
realm	The value of the **Realm** variable specified in the relevant list. For Helix Producer, this is given in the **Authentication** field under **Broadcasting>RealNetworks Encoding**. In the configuration file, it is given by the value of the `Realm` variable in the `G2_Encoders` list. For Helix Administrator users, use the value of the `Realm` variable in the `RealAdministrator_Files` list within the `FSMount` list in the configuration file.

3. A password prompt appears, followed by a prompt to type the password again. The resulting encrypted password is displayed on the screen.

Helix Universal Server encrypts passwords with the MD5 hashing algorithm. It uses the form `MD5("username:realm:new_password")`. On BSD systems and some other UNIX systems, you can generate these passwords with the following command:

```
echo -n "username:realm:new_password" | md5
```

4. Add the resulting encrypted password into the appropriate field of the database:
    - For text files, place it in the password field of the `Users` directory. See "Users Directory" on page 393.
    - For databases, place it in the password field of the `Users` table. See "Users Table" on page 397.

Using Databases

In its default configuration, Helix Universal Server uses a set of flat files to store user names, passwords, and permissions. For large-scale implementations of authentication, RealNetworks recommends that you tie Helix Universal Server into an ODBC-compliant or mSQL database that stores this information. The following table lists the flat file databases automatically installed with Helix Universal Server.

Default Databases

Name	User Names and Passwords	Purpose
`Admin_Basic`	Helix Administrator.	Validate access to Helix Administrator.
`CDist_Basic`	registered content caching subscribers	Verify subscribers requesting content from a publisher.
`Content_RN5`	content users	Validate users requesting secured on-demand or live content.
`Encoder_Basic`	Helix Producer	Verify content creators delivering live or simulated live broadcasts.
`Encoder_RN5`	RealProducer G2 through 8.5	Verify content creators delivering live or simulated live broadcasts.
`PlayerContent`	player GUIDs and user names for viewers accessing content	Validate unique IDs for players accessing content.

Supported Database Types

Helix Universal Server provides interfaces to several types of databases. Appendix C contains details about the database structure, which you'll need to know to integrate Helix Universal Server's authentication system with a relational database, for example.

Flat File Database

The default databases used for authentication are flat text files, which work well for storing relatively small amounts of data, such as a few hundred user names and passwords. You may want to use them to learn the authentication data structure before linking Helix Universal Server to a more robust relational database. If you choose to use the default flat files exclusively, you do not need to perform any additional configuration.

ODBC and mSQL

Helix Universal Server includes templates for common relational databases, covering mSQL and ODBC-compliant databases. To use an ODBC or mSQL database, you must configure your database to comply with the appropriate table structure described in Appendix C.

RN5 DB Wrapper

If you used authentication features with RealSystem Server version 5, or if you have a data store plug-in created by a third-party company, you can use that plug-in with Helix Universal Server version 9.0.

Adding a Database

Follow the procedure below to add a new database that stores user names and passwords. If you are using the default flat file databases, it is typically not necessary to add a new database.

➤ To add a database:

1. Click **Security>Databases**.
2. Click the "+" icon, and type a description for the new database in the **Edit Database Name** box.
3. From the **Database Type** list, select the data storage method you want to use. Database types are described in "Supported Database Types" on page 263.

4. Depending on the database type method you chose, additional information is required.
   a. **Flat File** needs only the path to the main text file directory. For example, the `enc_r_db` directory under the main Helix Universal Server directory. For more information, see "Understanding Authentication Data" on page 391.
   b. **mSQL** has two required names, and three optional items:

      Host Name—IP address or DNS name of computer where the database is stored.

      Database Name—Name of the database.

      Table Name Prefix—Prefix used to make field names unique, when used with an existing database.

      User Name—Name required by the database application.

      Password—Password required by the database application. Re-enter your password in the **Confirm Password** box to ensure that you typed it correctly.
   c. **ODBC** uses the same information as mSQL, but ODBC does not ask for a host name. Refer to "Setting Up Other Types of Data Storage" on page 399 for further instructions.
   d. For **RN5 DB Wrapper**, the following items are needed:

      Database Name—Name or location of the data storage plug-in. Consult your plug-in documentation for information about what should go here.

      Plugin Path—Location of the plug-in.

      User Name—Name required by the database application.

      Password—Password required by the database application. Re-enter your password in the **Confirm DB Login Password** box to ensure that you typed it correctly.
5. Click **Apply**.

Setting Up Realms

A realm connects users to databases. When you define passwords, you add them to a realm. The realm, in turn, specifies the encryption protocol, and

indicates the database where information is stored. If you are using the default authentication databases, as described in “Using Databases” on page 262, you can use the default realms, too, changing the authentication protocols if necessary. If you set up new databases, you need to create new realms, or point the existing realms to your new databases.

Predefined Authentication Realms

Realm	Authenticates	Realm ID	Protocol	Database
SecureAdmin	Helix Administrator	*servername*. AdminRealm	Basic	Admin_Basic
SecureCDist	content caching subscribers	*servername*. CDistRealm	Basic	CDist_Basic
SecureContent	content users	*servername*. ContentRealm	RealSystem 5.0	Content_RN5
SecureEncoder	live streams from RealProducer G2 through 8.5	*servername*. EncoderRealm	RealSystem 5.0	Encoder_RN5
SecureRBSEncoder	live streams from Helix Producer	*servername*. RBSEncoder Realm	Basic	Encoder_Basic

Authentication Protocols

Authentication protocols determine the password encryption and storage method used by Helix Universal Server. The server supports three protocols. Each realm uses just one protocol.

Basic

The Basic protocol sends the user’s name password over the public Internet in a simple manner, encoding them with the Base64 algorithm. Helix Universal Server decodes and verifies the password. Information can be stored in a flat file or a relational database. This protocol works with RealNetworks media players, as well as the QuickTime Player.

RealSystem 5.0

Also called *RN5*, this is a RealNetworks encryption protocol that works with RealPlayer 5 and later. It is more sophisticated and secure than the Basic protocol. Use it if your material will be served exclusively to users who have

RealPlayer 5 or later. Information can be stored in a flat file or a relational database.

Tip: For authentication of QuickTime Player or RealNetworks players earlier than version 5, use the Basic protocol.

Windows NT LAN Manager

The NTLM method is suitable for a Windows-based intranet. It enables Helix Universal Server to use the existing Windows NT database of user groups. It also allows access control of content through NTFS file permissions. This method requires that Helix Universal Server itself be installed on the Windows NT machine. When using NTLM authentication, be aware of the following:

- NTLM authentication works only with RealPlayer 5 and later.
- All users' accounts must exist on the local NT computer. NTLM authentication will not work with accounts on other servers within the domain, but it will authenticate against accounts on the primary domain controller.
- You add all user accounts through the Windows NT User Manager. Do not use the instructions in "Managing Users and Passwords" on page 258.
- The built-in guest account is not available for use in authentication.
- When you select NTLM authentication for Helix Administrator access, all groups are authenticated if you do not specify a user group.
- You cannot evaluate permissions on commerce rules when you use NTLM authentication.
- Blank passwords are not supported.

Creating or Modifying a Realm

The following procedure explains how to create a new realm or modify an existing one. It is generally not necessary to do this unless you have created a new database. Use a one-to-one correspondence between realms and databases. Do not create two realms, for instance, that use the same database.

➤ To create or modify a realm:

1. Click **Security>Authentication**.

2. To create a realm, click the "+" icon and enter a name for this realm in the **Edit Realm Description** box. To modify an existing realm, select it in the **Authentication Realms** box.
3. In the **Realm ID** box, type a name that will be used in other areas of Helix Administrator. The realm name may also appear to users as part of the name and password prompt. The default realms conform to the following format:

   servername.Realm_Id

   > **Warning!** You do not have to use the default convention, but you must include a period (.) in the realm ID or the realm will not work properly.

4. In the **Authentication Protocol** list, select the authentication method you want to use for this realm, as described in "Authentication Protocols" on page 265.
   a. If you choose `Basic` or `RealSystem 5.0`, select the database in the **Database** box.
   b. If you choose `Windows NT LAN Manager`, Helix Universal Server uses the NT list of names instead of a database. Type the appropriate provider in the **Provider** list, such as `NTLM`. Type the Group name in the **Group** box.
5. Click **Apply**.

Defining Commerce Rules

Commerce rules enforce authentication by defining protected paths. For example, the default commerce rule for on-demand clips defines the protected path `/secure/`, which corresponds to the `Secure` directory. When that path appears in a URL request, Helix Universal Server authenticates the request, allowing anyone with a valid user name and password to view clips in that directory. You can modify the default commerce rules, and create new commerce rules, to carry out tasks such as the following:

- Secure clips in locations other than the `Secure` directory. You can create a new commerce rule to secure the `Archive` directory, for example. As the section "Placing Secure Clips in Other Directories" on page 257 explains, you can also store clips on different network drives or machines, creating a new commerce rule to secure those assets.

- Secure all live broadcasts. Helix Universal Server automatically secures broadcasts that use protected paths such as `/broadcast/secure/` or `/encoder/secure/`. However, broadcasts that use just the broadcast mount points, such as `/broadcast/` or `/encoder/`, are not secured by default.

  Tip: If you changed the protected paths to `/broadcast/` and `/encoder/`, you would secure all broadcasts automatically.

- Allow multiple viewers to use the same user name and password to access an on-demand clip or broadcast. This lets you grant quick access to secured content to everyone within a division or a company, for example.
- Validate player IDs instead of user name and password combinations. For more on this, see "Validating Media Player IDs" on page 276.

  Note: Commerce rules apply only to viewers attempting to access secure clips or broadcasts. They do not apply to encoders or Helix Administrator users, for example.

Default Commerce Rules

Helix Universal Server defines a number of commerce rules that provide general access to secured content. For example, these rules allow access to on-demand clips in the `/secure/` path, or to broadcasts in the `/broadcast/secure/` path.

SecureG2LiveContent

The commerce rule `SecureG2LiveContent` grants access to live broadcasts encoded with RealProducer G2 through 8.5. The rule evaluates the protected path `/encoder/secure/`. Users requesting live broadcasts through this path are associated with the `SecureContent` realm by default, and must have a user name and password defined in this realm to gain access to the secured broadcast.

SecureLiveContent

`SecureLiveContent` grants access to live broadcasts encoded with Helix Producer 9 and higher, as well as simulated live broadcasts delivered through SLTA. The rule evaluates the `/broadcast/secure/` protected path. Users requesting live broadcast URLs that contain this path are associated with the `SecureContent` realm by default, and must have a user name and password defined in this realm to gain access to the secured broadcast.

SecurePlayerContent

This commerce rule, which is used for validating media player IDs, grants access to the `player` directory, a subdirectory of the `/secure/` mount point. User and client information must exist in the player database before viewers can access the content. The section "Validating Media Player IDs" on page 276 explains player ID validation.

SecurePreG2LiveContent

You use the `SecurePreG2LiveContent` commerce rule for content encoded with versions of RealProducer earlier than RealProducer G2. The rule evaluates the protected path `/live/secure/`. Users requesting URLs containing this path are associated with the `SecureContent` realm and must have a user name and password defined in this realm to gain access to the secured content.

SecureUserContent

This commerce rule grants access to on-demand content in which the request URL contains the `/secure/` mount point. Users requesting this content are associated with the `SecureContent` realm by default, and must have a user name and password defined in this realm to gain access to the secured content.

Adding or Modifying Commerce Rules

The following procedure explains how to add a commerce rule, or modify the overall attributes of existing commerce rules. The section "Handling User Permissions" on page 270 explains how to define permissions for a commerce rule.

➤ To create or modify a commerce rule:

1. Click **Security>Commerce**.
2. To create a new rule, click the "+" icon and edit the name that appears in the **Edit Rule Name** box. To modify a rule, select its name in the **Commerce Rules** box.
3. In **Protected Path**, enter the path that appears in the URL to invoke the commerce rule. For example, if you set up a `/secure2/` mount point for secured content, enter `/secure2` (no closing slash) in the box.

   For More Information: For more on creating additional secure mount points, see "Placing Secure Clips in Other Directories" on page 257.

4. In **User Permissions Database**, select the database that will store the user permissions. The default database for on-demand content is `Content_RN5`. The table "Default Databases" on page 262 lists the other default databases.

   Note: You can turn off individual user permissions for the commerce rule by selecting `Do Not Evaluate User Permissions`. In this case, all authenticated users have unlimited access to content protected by the commerce rule.

5. In the **Credential Type** list, select `Use User Authentication` to require user name and password validation. The other choice, `Use Player Validation`, validates access attempts according to player IDs, which is described in the section "Validating Media Player IDs" on page 276.
6. If you chose user name and password validation, you next select the realm in the **Realm** pull-down list. The default realm for on-demand content is `SecureContent`. The table "Predefined Authentication Realms" on page 265 lists the other default realms. User names and passwords must be defined in the selected realm, as described in "Managing Users and Passwords" on page 258.

   Warning! You must select the realm associated with the database you chose in the **User Permissions Database** field.

7. If you selected user name and password validation, you can set **Allow Duplicate User IDs** to `Yes`. This allows multiple people to use a single user account simultaneously. If you want to distribute a video to all employees in a division, for example, you can allow duplicate IDs and supply all persons in that division with the same user name and password.
8. Click **Apply**.

   Note: The **Player GUID Databases** section is used only with player ID validation. The section "Modifying the GUID Database" on page 279 explains how to use that part of the commerce rules page.

Handling User Permissions

Permissions are associated with commerce rules. They determine which authenticated viewers can see which content in a protected path. By setting up

permissions, you can grant access to clips on a person-by-person and file-by-file basis, for instance. You can also create permissions that allow secured access to clips or broadcasts only at certain times, or for certain durations. Note the following about permissions:

- Permission checking is enabled by default. This means that you must define permissions for individual users to give them access to secured content. Even if users have valid user names and passwords, they will not be able to view *any* content if they have no permissions defined.
- You can turn off permission checking for a commerce rule by choosing `Do Not Evaluate User Permissions` in the **User Permissions Database** pull-down list. In this case, all users with valid user names and passwords have unlimited access to all content protected by the commerce rule. For instructions on doing this, see "Adding or Modifying Commerce Rules" on page 269.
- Helix Universal Server does not evaluate permissions on commerce rules when you use the `Windows NT LAN Manager` authentication protocol. If you are using that protocol, there is no need to define permissions.

Permission Types

When you associate permissions with a user, you can set up two types of access. You can allow access to entire directories. You can also set up permissions file-by-file, or use a combination of these two methods.

Directory-Level Access

Directory-level access specifies that a user can view all of the content in a certain directory, as well as in its subdirectories, which inherit the permission. For example, you might give viewer A directory-level access to this path:

`/secure/confidential/`

The viewer then has access to files in that path, as well as in *any* subdirectory below that path. Thus, viewer A can access a clip in this path:

`/secure/confidential/secret/`

But viewer A does not have access to a path such as this:

`/secure/topsecret/`

File-Level Access

File-level access grants a user access to a specific file or live broadcast stream. As described below, you can also specify the duration or manner of this access. A single user may have both directory and file access for a clip in the same directory. If the directory access has expired, but the file access is still valid, the viewer can request the valid file, but no others in the directory. Conversely, if the file access has expired but the directory access is still valid, the viewer can request all files in the directory except the expired file.

Permission Access Types

Whether you give a viewer directory-level or file-level access, you can assign an access type as described in the following table.

Permission Types

Access Type	Permission Granted
Event	Unlimited viewing of a given clip or a directory of clips. This is the default.
Calendar	Permission expires on a certain date and time. If the expiration date and time arrive while the viewer plays a clip or broadcast, transmission stops and an error message appears.
Duration	Viewer gets a finite amount of time to view presentations. All viewing time is deducted from this amount. When the duration time elapses, permission is revoked.
Credit	Time spent viewing presentations is noted in the Helix Universal Server access log, and the administrator can use this information later for billing purposes. Access is granted per presentation or directory, and is unlimited. For information on the authentication access logs, see "Logs Directory" on page 394.

Note: With Duration or Credit permissions, Helix Universal Server accurately reports the total time a user views a secure file. If the end time minus the start time does not equal the total viewing time, for example, the discrepancy can be attributed to the user buffering, pausing, or seeking within the file. However, the total viewing time is the value debited or credited against the user's account, depending on the permissions used.

Permissions for SMIL Presentations

With a SMIL presentation, users are authenticated once regardless of how many files in the presentation are protected. If access to any clip in the presentation expires during the presentation, the presentation halts until more viewing time is allotted. For this reason, it is a good idea to keep permissions on all clips within a SMIL presentation the same. The following are the best methods of implementing authentication for SMIL files:

- Authenticate the SMIL file but not its contents. This is useful if you do not need a high level of security on all clips. In this case, it's a good idea to keep the view source feature set to its default, so that it does not show the full paths to the unsecured clips.

  For More Information: See "Displaying Source Information" on page 88.

- If you are using duration access, use it only for the longest clip in the presentation, which is typically an audio or video clip. Apply event access for the other files.

SMIL Files and Directory-Level Duration Access

If you define directory-level duration access for a SMIL presentation, giving identical permission to all files (including the SMIL file) will not work as you may expect. As each clip plays, Helix Universal Server subtracts the viewing time from the directory allotment. If each clip is 10 minutes long, and there are three clips in the presentation, Helix Universal Server subtracts 30 minutes from the total viewing time. This means that in setting up this type of access, the time allotted must be the sum of all the clips.

Tip: Keeping track of all the clips, their lengths, and the total directory access time can be tricky. An easier solution is to limit the access time only for the SMIL file.

Granting Permissions

You can create user permissions for commerce rules by following the procedure listed below. Note the following about defining permissions:

- You can define more than one permission for each user. You can give a single user permission to view several different clips, for example. You must define each permission separately, though, using the same user name each time.

- Each permission is associated with a single commerce rule. Typically, different commerce rules govern access to different directories or broadcasts. If you want to give a user permission to view one on-demand content directory and one broadcast, for example, you define one permission on the commerce rule governing on-demand clip access, and another permission on the commerce rule governing live broadcasts.
- The user name must first be defined in the database used by the commerce rule. For instructions about adding and browsing user names, see "Managing Users and Passwords" on page 258.

➤ To grant permissions to a user:

1. Click **Security>Commerce**.
2. Select the appropriate commerce rule in the **Commerce Rules** box.
3. Click the **Grant User Permission** link.
4. In the pop-up window, enter the user's name in the **User Name** box.
5. For **Path Type**, select `Directory` or `File` depending on the type of permission you want to add. For more information, see "Permission Types" on page 271.
6. The **Path** box indicates the directory or file that the viewer can access. It initially lists the protected path associated with the selected commerce rule. For example, if you're adding permissions to the default commerce rule for on-demand content (`SecureUserContent`), the path looks like this:

   `secure/`

   a. If you've chosen directory-level access, add to the protected path the subdirectory the viewer can access, as in the following:

      `secure/confidential`

      Note: The viewer can view clips in all subdirectories of the selected path.

   b. If you've selected file-level access, enter the subdirectory, if necessary, and the clip file name, as shown here:

      `secure/confidential/report.rm`

7. The **Access Type** pull-down list corresponds to permission types described in "Permission Access Types" on page 272.

   a. Set the menu to `Event` to allow unlimited access to the content.

b. If you choose `Calendar`, set an expiration date in this format:
`mm/dd/yyyy:hh:mm:ss`

c. For `Duration`, set in seconds the total amount of viewing time allowed.

d. Choose `Credit` to log the viewer's total access time in the access logs.

8. Click **OK**.

Editing User Permissions

After you assign permissions to a user, you can edit those permissions to change the viewing expiration date, for example, or give the viewer more or less total viewing time on a directory or file.

➤ To modify user permissions:

1. Click **Security>Commerce**.
2. Select the appropriate commerce rule in the **Commerce Rules** box.
3. Click the **Edit User Permission** link.
4. In the pop-up window, enter the user's name in the **User Name** box. See "Browsing All User Names" on page 260 for information about listing user names.
5. For **Path Type**, you can select `Directory` or `File` to change the type of permission. For more information, see "Permission Types" on page 271.
6. The **Path** box indicates the directory or file that the viewer can access. For more information on this, see Step 6 on page 274 in the procedure for granting permissions.
7. If you had set an expiration date on the user permissions, you can enter a new date in the **New Expiration Date** box in this format:
   `mm/dd/yyyy:hh:mm:ss`
   After doing so, click **Set New Date**.
8. If you set a duration on the user permissions, you can modify the viewing time allowed. Choose `Add` or `Subtract`, and enter the amount of time in seconds. Then click **Change Time**.
9. Click **Close Window**.

Revoking User Permissions

You can revoke some or all permissions granted to a user. Keep in mind, though, that each revocation applies only to the selected commerce rule. If a user has permissions defined for other commerce rules, you must revoke those permissions separately. Helix Administrator does not provide a means for revoking permissions for several users or several commerce rules at a time.

> **Tip:** See “Browsing All User Names” on page 260 for information about listing user names.

➤ To revoke a single permission for a user:

1. Click **Security>Commerce**.
2. Select the appropriate commerce rule in the **Commerce Rules** box.
3. Click the **Revoke User Permission** link.
4. In the pop-up window, enter the user’s name in the **User Name** box.
5. For **Path Type**, select `Directory` or `File` according to the type of permission you want to revoke. For more information, see “Permission Types” on page 271.
6. The **Path** box indicates the directory or file that the viewer can access. For more information on this, see Step 6 on page 274 in the procedure for granting permissions.
7. Click **OK**.

➤ To revoke all permissions for a user:

1. Click **Security>Commerce**.
2. Select the appropriate commerce rule in the **Commerce Rules** box.
3. Click the **Revoke All Permissions** link.
4. In the pop-up window, enter the user’s name in the **User Name** box.
5. Click **OK**.

Validating Media Player IDs

For authentication of on-demand content or broadcasts, you can validate media player IDs rather than user name and password combinations. For the privacy reasons described below, this method of authentication is better suited

for an intranet, although you can use it with the public Internet. With player ID authentication, users first register their player IDs through a special URL. They can then view protected content without having to enter a user name and password. Media player ID validation works only with RealPlayer 4 and higher.

Player IDs and User Privacy

For player ID validation to work, players must be configured to send a globally unique ID (GUID) to Helix Universal Server. For privacy protection, the standard RealOne Player that viewers download over the Internet is set by default *not* to send a GUID, in accordance with RealNetworks' Consumer Software Privacy Statement, which is published on the following Web page:

http://www.realnetworks.com/company/privacy/software.html

Because sending a GUID is solely at the discretion of each user, you must request users to change their default GUID setting (on RealOne Player, the command is **Tools>Preferences>Connection>Internet Settings**) to register their GUIDs and enable player ID authentication for material delivered over the Internet. Users who decline to do so will be denied access to secure content. However, you can reroute these users to a non-secure Web URL that explains their options, as described in "Setting Up Commerce Rules" on page 278.

Using Player ID Validation on an Intranet

In an enterprise setting, you can control whether or not RealOne Player transmits its GUID when you use RealNetworks' Desktop Resource Manager. You can turn GUID registration on by default for all users, making it easier to set up player ID validation on an intranet. For more on Desktop Resource Manager, visit the following Web page:

http://www.realnetworks.com/products/ria/rdm/index.html

Choosing a Database and Realm for User Names

Helix Universal Server installs a default database, `PlayerContent`, for use with player ID validation. You can use this database, or add your own relational database. You need to associate a realm with the player ID database only to populate it with user names initially. After that, Helix Universal Server refers directly to the database to validate player IDs, and does not refer to the realm again. Note the following:

- If you do not want to use the default `PlayerContent` database (you want to use a relational database instead, for instance), set up your database first, as described in "Using Databases" on page 262.
- If you do not plan to implement user name and password validation for any on-demand content, you can associate the default `SecureContent` realm with the player ID database you use.
- If you think that you may enable user name and password validation in addition to player ID validation, create a new realm for player ID validation, and associate it with your player ID database. This leaves the `SecureContent` realm available for user name and password validation.

The section "Creating or Modifying a Realm" on page 266 explains how to create a new realm or modify the `SecureContent` realm. For the realm you decide to use, select the `PlayerContent` database (or the relational database you're using) in the **Database** pull-down list. You can set the **Authentication Protocol** to `Basic` or `RealSystem 5.0`. Passwords are not used, so either protocol setting has the same effect.

Adding User Names to the Player ID Database

After you select your realm for player ID validation, add user names to that realm for each user as described in "Adding a User" on page 258. Users will then register with Helix Universal Server once using their user names. Helix Universal Server associates each user name with the unique player ID in its database. It validates subsequent access attempts through the ID without asking the user to enter a user name. Because user names are associated with player IDs, though, you can use the names to set up permissions.

> **Note:** The database structure requires that you enter a password for each user, even though passwords aren't used with player ID validation. You can therefore enter the same password for each user.

Setting Up Commerce Rules

Helix Universal Server provides a default commerce rule called `SecurePlayerContent` that authenticates access attempts through player IDs. You do not have to change any settings to use this default rule to secure on-demand content. To modify this rule or create a new one, refer to the

instructions in “Adding or Modifying Commerce Rules” on page 269. Note the following about commerce rules used with player ID validation:

- By default, the **Protected Path** is `/secure/player` rather than `/secure`, which is used with user name and password validation. The `/secure/player` path corresponds to a `player` subdirectory of the `Secure` directory. This subdirectory is *not* created during installation, however, so you need to create it to use player validation.

  Tip: You can use another directory on your network. To do this, follow the instructions in “Placing Secure Clips in Other Directories” on page 257, modifying your commerce rule appropriately.

- By default, **User Permissions Database** is set to `PlayerContent`. Change the database choice if you are using a different database. If you do not want to evaluate permissions, and wish simply to grant all authenticated users access to all content in the protected path, select `Do Not Evaluate User Permissions`.

  Note: If you plan to use permissions for individual viewers, follow the instructions in “Granting Permissions” on page 273.

- For **Credential Type**, you must always select `Use Player Validation` for player ID authentication to work.
- Click **Redirect Unauthenticated Players** to enter a fully qualified HTTP or RTSP redirection URL for viewers who have not registered, or who have chosen not to transmit their player GUIDs.
- To validate live broadcasts through player IDs, create a new commerce rule as described in “Adding or Modifying Commerce Rules” on page 269, and set **Protected Path** to `/broadcast/secure/player` (for broadcasts from Helix Producer 9 and later) or `/encoder/secure/player` (for broadcasts from RealProducer G2 through 8.5). On the encoder, specify the virtual path `secure/player/` along with the stream name when starting the broadcast.

Modifying the GUID Database

The Helix Administrator Commerce page allows you to select the database that registers player IDs. You do not need to change the default setting if you are using the default `PlayerContent` database. You need to change the GUID

database settings only if you are not using the default database, or you want to change the prefix used in URLs to register users.

➤ To modify the GUID database:

1. Click **Security>Commerce**.
2. Select an existing database name, or click the "+" icon to create a new database entry, naming the database in the **Edit Description** field. The name is for your reference only.
3. Enter a prefix in the **Player Registration Prefix** field. You'll use this prefix in URLs that viewers click to register their player IDs, as described in "Creating Registration URLs" on page 280.
4. Select the database to use through the **Player Database** pull-down list.
5. Click **Apply**.

Creating Registration URLs

To register individual RealOne Players, you create a link that viewers click once to add their players' GUIDs to the database. The registration URL, which users can enter in the **File>Open Location** box of RealOne Player, looks like this:

`rtsp://helixserver.example.com/register`*`Name`*`!`*`clip.rm`*

If you add the URL to a Web page link, you use an HTTP URL and `/ramgen/`, as shown here:

`http://helixserver.example.com/ramgen/register`*`Name`*`!`*`clip.rm`*

Note the following:

- The registration prefix is `register` by default, but can be changed as described in "Modifying the GUID Database" on page 279.
- After the Helix Universal Server address, you combine the registration prefix with the viewer's user name. For example, you might use `registerMiguel21`.
- For *`clip.rm`*, specify a clip in the unsecured `Content` directory, not a clip in a secured directory. This can be any clip that the player can display. It may simply be a graphic that indicates a successful registration.
- Once a GUID is registered, subsequent registration attempts are ignored.

Writing Content URLs

After viewers contact Helix Universal Server through the registration URL, they can begin to access content for which they have permission. Media clips go in the secure directory defined by the commerce rule, as described in "Setting Up Commerce Rules" on page 278. The default path is the `player` subdirectory (which must be created manually) of the `Secure` directory. Web page links to this content look like this:

```
http://helixserver.example.com/ramgen/secure/player/business/video1.rm
```

In the preceding example, `/business/` is an optional path that corresponds to an actual subdirectory in the protected path. These subdirectories can be any number of levels deep, and you can assign various users privileges for different subdirectories as described in "Granting Permissions" on page 273.

A Web page link to a live broadcast looks like this:

```
http://helixserver.example.com/ramgen/broadcast/secure/player/live.rm
```

Here, `/broadcast/` is the appropriate broadcast mount point, as described in Chapter 7. The encoder that sends the stream to Helix Universal Server must supply the `/secure/player` virtual path along with the broadcast stream name.

> **Note:** As noted in "Setting Up Commerce Rules" on page 278, a commerce rule for the `/broadcast/secure/player` protected path is not predefined, so you must create it to secure broadcasts through player ID validation.

> **For More Information:** For background on URLs and links, see "Writing Links to Content" on page 73.

PART

VI

COMMERCE

This section describes Helix Universal Server's revenue-generation features. Find out how to create a media server that delivers advertisements, or how to enable customers to serve their own media files.

CHAPTER

14

ISP HOSTING

ISP Hosting features provide a way to allot connections to users. If you are an Internet Service Provider (ISP), you can use ISP hosting to deliver streaming media on behalf of your customers.

Understanding ISP Hosting

Helix Universal Server works with your existing user accounts and directory structure to make users' media files available for streaming. You allocate a minimum and maximum number of connections for each account, based on the number of streams permitted by your license. Allocating on a per-connection basis, rather than by stream, ensures that all files, including SMIL files which reference multiple streams, will always be served.

User account information is stored in a text file, which lists pathing and connection information. List all user account information in a single file, or use separate files to make management easier. Within the user list file, create customized account path and connection information. Or, create a single entry that applies to all user accounts.

Links to Users' Hosted Content

Links to hosted content have the following format if used in a Web page:

`http://server.example.com:HTTPPort/ramgen/~`*`username`*`/filename.rm`

The link which Helix Universal Server uses, or which you can type directly into RealOne Player, has the following format:

`rtsp://server.example.com:RTSPPort/~`*`username`*`/filename.rm`

Account Information

When Helix Universal Server receives a request for streaming media, it looks at user account information, stored in user list files, to determine which user is hosting the requested content.

User list files can list account information separately for each user, or can give generic information that applies to all users.

Each account has three items associated with it:

- Account name
- Virtual path where the account's files will be stored
- Minimum and maximum connections available to the account

Account information is stored in text files, called user list files. You can put all information into a single file or use separate files to make organization easier.

Connections Available for Each Account

Each account has a reserved number of connections and a maximum number of connections associated with it. The user list file can contain a generic account description that applies to all users, specific instructions about certain accounts, or a combination of the two.

The maximum setting refers to the highest number of connections that will be available for a particular customer's content. Anyone who tries to watch a clip after that account's maximum number of connections are in use will receive an error message, even if connections are available to other accounts.

The number of connections reserved for ISP hosting depends on the type of user record within the user list file:

- Specific user account descriptions
- Generic user account description

If you use a combination of account descriptions, be sure to read both topics in this section.

Specific User Accounts

The reserved setting ensures that the specified number of connections will always be available to clients that attempt to view a particular user's hosted media.

All reserved connections are subtracted from the overall number of connections available to Helix Universal Server. The remaining connections are available for non-ISP-hosted content, or for hosted content that hasn't yet been requested. For example, if your Helix Universal Server is licensed for 50 connections, and you reserve 20 connections through the ISP hosting feature, there are 30 connections available for general use. Helix Universal Server can

use those remaining connections for streaming regular clips, or for users of ISP-hosted material that isn't yet reserved.

Reserved connections are only activated for accounts listed in the user files, and are activated as soon as Helix Universal Server starts.

> **Tip:** To guarantee that connections will always be available for certain customers, list those account names in the user file, rather than using a generic scheme. Be careful to leave enough streams available for other use, however.

Users whose accounts are not specifically listed in the user list file default to the generic account description.

Generic User Account

For accounts not described in the user list file, minimum connections are not reserved until content is played from a user's account.

Other Considerations

It is possible to reserve more connections than are included in your license. In this case, connections are distributed on a first come, first served basis.

For example, if your Helix Universal Server is licensed for 50 connections, and you create a generic account that reserves a minimum of 3 connections for all 25 customers, all the connections will be reserved for ISP hosting customers. Since 75 connections are reserved, but only 50 connections are available, the first 50 customers who connect will be able to play content, but anyone connecting after that will not.

Tracking Account Usage

Like any content it serves, Helix Universal Server creates a record for each file it serves in the access log. The fourth field in each record of the access log, identified by the `GET` statement, lists the path and filename of each clip served. Compare this information to the path information you've set up to determine how many clips have been streamed from each account.

In most cases, Helix Universal Server creates one record for each clip served. However, SMIL presentations served from your clients' accounts may generate more than one record. You can see which records are part of a SMIL presentation by looking at the final number in the record (present if Logging Style is 5). These numbers will match if they are from the same SMIL presentation. See "SMIL files" on page 333.

Account-Based ISP Hosting

The `GET` statement will include the ISP hosting mount point and the user's account name (beginning with the ~ character). For example, a file with the URL:

`http://server.example.com:HTTPPort/ramgen/~chris/file.rm`

would appear in the access log as:

`GET ~chris/file.rm`

Dedicated ISP Hosting

Because dedicated ISP hosting Helix Universal Servers can only stream content for users, and not stream any other type of content, the access log will only show material streamed for ISP customers. The mount point will always appear.

The GET statements will show the directory portion of the URL.

A file with the following URL:

`http://server.example.com:HTTPport/ramgen/r/ra/rabrams/file.rm`

would appear in the access log as:

`GET r/ra/rabrams/file.rm`

Dedicating Helix Universal Server to ISP Hosting

Helix Universal Server can be dedicated to only serving hosted content. If you use this option, Helix Universal Server cannot stream media files from any other directories.

This option requires that users' directories are arranged in a hierarchy. Features available in dedicated hosting are the same as in account-based hosting.

URLs used in this type of hosting have a different format. Rather than use a tilde (˜) to alert Helix Universal Server to an upcoming ISP request, this method relies on a directory structure shown in the URL.

`http://server.example.com:HTTPPort/ramgen/s/sa/sandy/media/filename.rm`

or

`rtsp://server.example.com:RTSPPort/s/sa/sandy/media/filename.rm`

A comparison of the two styles is shown below. Use only one style on a particular Helix Universal Server.

Comparison of Account Identification Styles

Issue	Account-Based Hosting	Dedicated Hosting
Hosted material	Can host content for ISP users; can also serve ordinary streamed content.	Can only host content from user accounts. Cannot serve other content.
User directory structure	Works with any directory structure; enables different structures or locations. Users may have their own subdirectories.	Works with a hierarchical directory structure, especially an alphabetic one. Organization of directories must be the same for all users. Users may have their own subdirectories.
Reserving connections	Can reserve number of connections available for material streamed from certain accounts.	Cannot guarantee any reserved connections.
User settings	Some users can have customized settings, while generic connection settings describe all other users.	All users have identical settings.

Compatibility with Earlier Versions of RealSystem Server

If you used ISP Hosting in RealSystem Server versions 3 through 5, you can still use the UserList from your previous configuration file. Refer to "Creating User Lists From Earlier Versions" on page 296 for instructions on how to use your existing UserList.

Earlier versions of RealSystem Server listed minimum and maximum settings for the number of streams available to each account. In Helix Universal Server version 9.0, those settings now refer to the number of connections available to each account. This enables customers to serve SMIL files—which may reference several streams simultaneously—without running out of streams.

This manual uses new terminology for the methods of referring to account structures described in editions of *RealServer Administration Guide* previous to version 8.

- "Naming Convention One" is now described as the usual method of configuring user list files.

- “Naming Convention Two” is described here as a dedicated hosting Helix Universal Server, a special case.

Although they have different names in this manual, the user directory structures and user list structures in each method are functionally identical to the methods used in earlier versions of RealSystem Server.

Example ISP Hosting Scenario—Northwest ISP

Throughout this chapter, we’ll use the example of an ISP who sets up Helix Universal Server to host its users’ media files. Northwest ISP hosts content for customers in a three-state area in the United States’ Pacific Northwest. Users’ directories are organized according to the state in which the users live—Washington, Oregon, and Idaho:

```
C:\home\washington
C:\home\oregon
C:\home\idaho
```

Individual accounts are located immediately below these directories:

Chris Anderson’s account:	`C:\home\washington\canderson`
Pat Brown’s account:	`C:\home\washington\pbrown`
Lee Adams’ account:	`C:\home\oregon\ladams`
Sandy Chu’s account:	`C:\home\oregon\schu`

Other accounts:	`C:\home\idaho\alex`
	`C:\home\idaho\sam`
	`C:\home\idaho\tracy`

The links to these users’ files look different than other Helix Universal Server links. These all contain a tilde (˜) and the user’s usernames or account names:

```
http://server.example.com:HTTPport/ramgen/~chris/file.rm
http://server.example.com:HTTPport/ramgen/~lee/file.rm
http://server.example.com:HTTPport/ramgen/~pat/file.rm
http://server.example.com:HTTPport/ramgen/~sandy/file.rm
```

Users’ Directory Structures

Helix Universal Server matches your existing directory locations of users’ files, even if you use different structures for different users. Typically, user directories are named with the username of the account; the username is included in the URL.

Customers' media files are stored in their directories. If they place files in a subdirectory of their main directory, that subdirectory must be included in the URL.

Directory Structures in Dedicated Hosting

A Helix Universal Server used exclusively for hosting users' streamed media from accounts based on a strict directory structure uses an alternate method of identifying accounts. In the user list, you identify how far down the directory path to look for individual user accounts; this requires that the accounts must all be at the same level.

In the following example, accounts are divided into separate directories, according to an alphabetic arrangement:

```
...
/UserAccounts/r/ra/rabrams
/UserAccounts/r/ra/radams
...
/UserAccounts/s/sa/sanderson
/UserAccounts/s/sb/sbraun
/UserAccounts/s/sb/sbrown
/UserAccounts/s/sc/schu
...
```

Users may have their own subdirectories. If they place files in a subdirectory of their main directory, that subdirectory must be included in the URL.

Of course, if you use the account-based style of identifying customer directories rather than the method described in this section, you can also dedicate Helix Universal Server to only hosting streamed media for customers, but other streaming options are still available.

Setting Up ISP Hosting

There are three steps for configuring Helix Universal Server to host users' media files:

1. Create the user list file.

   This file establishes account information, such as reserved connections and maximum connections. For more information, see "Creating the User List" on page 292.

2. Configure Helix Universal Server.

The configuration file indicates where to find the user lists, and completes the pathing information needed to located the users' media. For more information, see "Configuring Helix Universal Server" on page 296.

3. Creating the links to content.

   You will need to tell customers what format they should use in creating their links. For more information, see "Linking to ISP Content" on page 298.

Creating the User List

Create the user list, and store it anywhere that is accessible to Helix Universal Server.

The user list is a text file with the following format:

```
UserList [
{account, /path/, minimum_connections, maximum_connections}
]
```

where:

account is either a specific user name, or ~* to indicate that all accounts will use the same settings. See "Using Multiple User List Files" on page 294 for examples of how multiple accounts can be shown in a user list.

> **Note:** Dedicated hosting Helix Universal Servers use a slightly different format. Refer to "Dedicated Hosting User File Format" on page 295 for the correct format to use.

/path/ gives information about the location of users' media files. It does not necessarily refer to an actual location or portion of a location; instead, it is a logical method of grouping the users.

minimum_connections is the minimum number of connections reserved for this user. `0` indicates that no connections are reserved. See "Connections Available for Each Account" on page 286 for more information.

maximum_connections is the maximum number of connections available to this user. `0` indicates that no connections may be used. See "Connections Available for Each Account" on page 286 for more information.

> **Tip:** You can include comments in the file by preceding a line with a semi-colon (;).

Example—User List File

In this user list file (shown in the left column of the table), users are grouped according to their geographic location. Two users, Chris and Pat, are in the Washington (wa) group. Two other users, Lee and Sandy, are in the Oregon group.

Sample User List

User List File Contents	Matching Customer Name
`UserList [`	
`{chris, /wa/canderson/, 2, 5},`	Chris Anderson
`{lee, /or/ladams/, 0, 100},`	Lee Adams
`{pat, /wa/pbrown/, 2, 50},`	Pat Brown
`{sandy, /or/schu/, 1, 35},`	Sandy Chu
`]`	

Listing Individual Accounts

If each account has different settings, create a separate record for each user, as in the example above.

Listing Generic Accounts

If you have a large number of accounts to create, and they will all use the same number of connections, create a single entry that refers to all accounts generically:

```
UserList [
{~*, /path/, minimum_connections, maximum_connections}
]
```

In the following example, one connection is reserved for each person, and the maximum number of connections available for any account is 35. (There are some restrictions on whether the connections are actually reserved; see “Connections Available for Each Account” on page 286.)

```
UserList [
{~*, /users/, 1, 35}
]
```

Combining Individual Account Listings with a Generic Listing

Custom account information and generic settings can be combined in a single user list. Combining them is convenient if most users have the same settings,

but a few have different number of connections reserved, or use different paths:

```
UserList [
{username1, /path/, minimum_connections, maximum_connections}
{username2, /path/, minimum_connections, maximum_connections}
{username3, /path/, minimum_connections, maximum_connections}
...
{~*, /path/, minimum_connections, maximum_connections}
]
```

In the following example, customized accounts for four users have been created, and all other accounts will use the default settings shown in the last entry:

Sample User List

User List	Customer Name
`UserList [`	
`{chris, /wa/canderson/, 2, 5},`	Chris Anderson
`{lee, /or/ladams/, 0, 100},`	Lee Adams
`{pat, /wa/pbrown/, 1, 35},`	Pat Brown
`{sandy, /or/schu/, 1, 5},`	Sandy Chu
`{~*, /id/, 1, 35}`	All others not specified above
`]`	

Using Multiple User List Files

You can create as many user lists as you want; using multiple files can make administration easier. For example, an ISP provider might include commercial accounts in one user list file and personal accounts in another file.

Helix Universal Server loads the user lists in the order they appear in the configuration file, and any settings in subsequent files override settings in previously-loaded files. If the same user name appears in more than one list, Helix Universal Server uses the settings in the last user list.

Because of this behavior, bear in mind the following considerations when using multiple user list files:

- An account name must not appear in more than one file.
- The generic account information (an entry beginning with ~*) must be used carefully. Include it only in the first-loaded user list file. If you

include it in the last file, Helix Universal Server will ignore all the other user lists.

Re-Reading an Updated User List File

Once you have created the user list file and the ISP hosting feature is in use, you must instruct Helix Universal Server to re-read the user list.

- On Windows-based platforms, after you edit a user list file, you must restart Helix Universal Server for the changes to take effect.
- On UNIX-based platforms, you can use the SIGHUP command to instruct Helix Universal Server to re-read the user list files. See "Helix Universal Server Restart" on page 384.

Dedicated Hosting User File Format

The format of the user list file in dedicated hosting is nearly the same as the account-based method, with these exceptions:

- Create only one user file. You cannot use more than one with the dedicated hosting server.
- Create only one entry in the user file. This entry applies to all user accounts.
- Instead of giving an account name, you indicate how far to traverse the user directory structure in order to find the unique user directories.

Use the following format:

```
UserList [
{*n, /path/, minimum_connections, maximum_connections}
]
```

where *n* is a number that represents the level of directory at which individual user directories appear.

Example

In the following example, all user accounts are located under a subdirectory of the UserAccounts directory. The unique directories are located at the fourth directory level (rabrams, radams, sanderson, and so on).

```
...
/UserAccounts/r/ra/rabrams
/UserAccounts/r/ra/radams
...
/UserAccounts/s/sa/sanderson
```

```
/UserAccounts/s/sb/sbraun
/UserAccounts/s/sb/sbrown
/UserAccounts/s/sc/schu
...
```

The user list for this example uses `4` for the value of *n*:

```
UserList [
{*4, /UserAccounts/, 1, 15}
]
```

URLS created with this method have the following format:

`rtsp://server.example.com:554/`*`directory1/directory2/directory3/filename`*

For example,
`rtsp://server.example.com:554/UserAccounts/r/ra/rabrams/band.rm`

Creating User Lists From Earlier Versions

Recycle your UserList entry from the configuration file of earlier versions. If your UserList is long, you may want to create more than one file.

After you create the new user list file, follow the instructions in "Configuring Helix Universal Server".

➤ **To create a user list from existing settings:**

1. Open your old configuration file in a text editor.
2. Locate the `UserList` entry.
3. Copy and paste the existing `UserList` setting into a new text file.
4. Save the file. You can store it in any directory that is available to Helix Universal Server.

Another item from the previous configuration file, `UserDir`, does not have an equivalent.

Configuring Helix Universal Server

You will need to make a note of the values for `/path/` that you used in the user list file.

These instructions describe how to create a separate mount point for each customer category, which means customer files can be stored in separate base paths or drives.

➤ To configure Helix Universal Server for ISP Hosting:

1. First, look in the user list files at the /path/ settings you have used. You will need this information in Step 11.
2. Click **Server Setup>Mount Points**.

   You will add a mount point for each path in the User List file, give it a name, and indicate a base path.
3. Click the "+" icon and enter a mount point description in the **Edit Description** box.
4. In the **Mount Point** box, type a name for the new mount point.

   In our example, type /wa_isp/.
5. In the **Base Path** box, type the location in which these paths should be mapped.

   In our example, type C:\home\washington.
6. Repeat Step 3 through Step 5 for each mount point and base path combination.

   In our example, we used the following settings:

Example Settings

Mount Point	Description	Base Path
/wa_isp/	ISP Content (Washington users)	C:\home\washington
/or_isp/	ISP Content (Oregon users)	C:\home\oregon
/id_isp/	ISP Content (Idaho users)	C:\home\idaho

7. Click **Apply**.
8. Click **Content Management>ISP Hosting**.
9. In the **Translation Mounts** area, click the "+" icon and type a description in the **Edit Translation Mount Description** box.
10. From the **Mount Point** list, select the mount point that you want to use for this Translation Mount. (You created these in Step 2 through Step 6.)
11. In the **User Path** box, type the value of /path/ from the user list file.

    For each /path/ that appears in the user list file, repeat Step 9 through Step 11 to associate the /path/ with a translation mount.

In our example, we have created a separate user path for /wa/, for /or/, and for /id/.

Example User Paths

Translation Mount Description	Mount Point	User Path
Washington users	/wa_isp/	/wa/
Oregon users	/or_isp/	/or/
Idaho users	/id_isp/	/id/

12. In the User List files section, click the "+" icon. A generic user list name appears in the **Edit User List File Name** box. Type the correct path to the user list you created in "Creating the User List" on page 292. Be sure to give the full path. To add more than one user list this for each list you want to add. In dedicated hosting, reference only one user list file.
13. Click **Apply**.

Linking to ISP Content

You'll need to tell your customers what format to use for their links.

Links in a Web page use this format:

http://*address*:*HTTPPort*/ramgen/~*account*/*path*/*file*

Helix Universal Server URL Components

Component	Meaning
http	The protocol used to initiate streaming.
address	Machine and domain name of Helix Universal Server. IP address may be substituted.
HTTPPort	Port number where Helix Universal Server listens for requests sent via the protocol listed at the beginning of the URL. This value is usually 80 or 8080; see "Defining Communications Ports" on page 59.
ramgen	Required when you link in a Web page.
account	User's account name.
ramgen	The mount point tells Helix Universal Server how the clip should be served.

(Table Page 1 of 2)

Helix Universal Server URL Components (continued)

Component	Meaning
path	Optional.
file	The file name itself, including the extension.

(Table Page 2 of 2)

For samples of links to use in the Web page, see "Example ISP Hosting Scenario—Northwest ISP" on page 290.

Links typed directly in the player or used in a Ram or SMIL file use the following format:

`rtsp://`*`address`*`:`*`RTSPPort`*`/~`*`account`*`/`*`path`*`/`*`file`*

The format is nearly the same as the link used in the Web page: the protocol is different, the port number (if any) matches the protocol, and Ramgen is omitted.

Dedicated Hosting Server

Links in a Web page use this format:

`http://`*`address`*`:`*`HTTPPort`*`/ramgen/`*`directory1`*`/`*`directory2`*`/`*`path`*`/`*`file`*

where:

Helix Universal Server URL Components

Component	Meaning
`http`	The protocol used to initiate streaming.
address	Machine and domain name of Helix Universal Server. IP address may be substituted.
HTTPPort	Port number where Helix Universal Server listens for requests sent via the protocol listed at the beginning of the URL. This value is usually `80` or `8080`; see "Defining Communications Ports" on page 59.
`ramgen`	The mount point tells Helix Universal Server how the clip should be served.
directory1	Each directory that is part of the hierarchy of directories. The number of directories you list must match the *n* number in the user list file.
directory2	
path	Optional. Represents any subdirectories of the user's home directory.
file	The file name itself, including the extension.

Using the example in "Dedicated Hosting User File Format" on page 295, a link to `file.rm` in the user directory `/UserAccounts/r/ra/rabrams` would look like the following:

```
http://server.example.com:HTTPport/ramgen/r/ra/rabrams/file.rm
```

ISP Hosting Used with Other Features

Users inherit many features of your Helix Universal Server: hosting of on-demand content, and access control are available.

Other Feature	Notes
Authentication	Not available for hosted material.
Live unicasting, multicasting, and splitting.	Not available for hosted material.
Monitoring statistics	As the administrator, you are able to view how many clients are connected to all material served by your Helix Universal Server, using Server Monitor. In order to discern which material belongs to users, you must examine the paths of the individual clips in use. You also can see which clips have been served by reading the access log file.
Helix Universal Proxy	Helix Universal Proxy is able to cache your users' content, just as it can cache any on-demand files served by this Helix Universal Server.

CHAPTER

15

TARGETED ADS

Helix Universal Server can dynamically insert ads into streaming presentations. Offering integration with any HTML-based ad serving system, Helix Universal Server uses SMIL (Synchronized Multimedia Integration Language) to lay out ads and requested content in RealNetworks player software. This chapter explains how to set up Helix Universal Server's ad streaming features.

> **For More Information:** The ad chapter in *RealSystem Production Guide Release 8* explains how to write SMIL-based presentations that include streaming ads.

Understanding Ad Streaming

Helix Universal Server requires no special programming to integrate with popular ad serving systems. Ad servers are designed to place ad URLs in requested Web pages. To get ads from a third-party ad server, Helix Universal Server simply requests HTML containing the ad URLs from the ad server. That HTML may come directly from the ad server, or through a page hosted on a Web server.

When it receives the returned HTML, Helix Universal Server extracts the ad's file URL and hypertext link URL. It then inserts these URLs into the SMIL presentation requested by the client player. Through this method, any third-party ad server designed for HTML pages can serve ads to the RealNetworks SMIL-based player.

Banner Ads

Helix Universal Server can deliver single banner ads and rotating banner ads for prerecorded content or live broadcasts. With rotating banner ads, Helix Universal Server sends RealNetworks player a new GIF, animated GIF, or JPEG ad at regular intervals throughout a presentation. To include ads with

requested clips, content creators write a SMIL file that has one or more regions for ads. Instead of ad URLs, the SMIL file contains one or more `<RealAdInsert/>` tags that Helix Universal Server expands into unique ad URLs when the RealNetworks player requests the file. You can also use the SMIL generation feature, described below, to avoid writing SMIL by hand.

Streaming Media Ads

Although Helix Universal Server can deliver standard banner ads, its power lies in its ability to stream ads in formats such as RealAudio, RealVideo, RealText and Flash. The delivery mechanism for streaming media ad URLs is the same as for static image ad URLs: the ad server places URLs in HTML requested by Helix Universal Server. The only difference is that these ad URLs are for RTSP-streamed clips on a Helix Universal Server host, rather than for HTTP-downloaded image files on an ad server.

SMIL Generation

For ad layout, Helix Universal Server uses SMIL 1.0, which is compatible with RealPlayer G2 and later. Although you have more flexibility when writing your own SMIL files, Helix Universal Server's SMIL generation feature can automatically create or modify SMIL files that include ads. You can thereby stream ads without writing or modifying SMIL files by hand. This feature is useful if you have a large collection of existing clips or SMIL presentations for which you want to include ads. SMIL generation works for banner ads as well as lead-in ads.

Quick Start for Testing Ad Banner Insertion

Helix Universal Server comes preconfigured for inserting banner ads into streaming presentations. Follow the steps below to see a sample streaming banner ad.

➤ To test banner ads using a RealNetworks Web server:

1. Start Helix Universal Server.
2. Start the RealNetworks player and choose **File>Open Location**.
3. Enter the following URL, substituting the actual name of your Helix Universal Server for `yourserver.com`, and Helix Universal Server's RTSP port for `554`:

```
rtsp://yourserver.com:554/adtag/general/smilgen/banner/real9video.rm
```

Requesting this URL verifies that ad streaming works by playing the `real9video.rm` clip included with Helix Universal Server. The `/smilgen/banner/` mount point in the URL causes Helix Universal Server to generate a SMIL file that defines a banner ad region and a video region. The `/adtag/general/` mount point is preconfigured to pull a banner ad from a RealNetworks Web server.

Testing Your Own Banner Ads

You can quickly modify Helix Universal Server to pull ads from your ad serving system instead of the RealNetworks Web server. Just point Helix Universal Server to a Web page that provides the ad URLs.

➤ To test banner ads using your own Web server:

1. Choose the Web page where Helix Universal Server gets ads. For testing purposes, you can use any page on your Web site that includes a 468-pixel by 60-pixel top banner ad in GIF or JPEG format.
2. Click **Advertising>Ad Serving**. This displays a dialog for configuring Helix Universal Server to work with your ad serving system.
3. Highlight `/adtag/general/`.
4. In the **Target HTML** field, change the default value of **http://www.real.com/ads/g2ads_def.html** to the fully qualified URL of the Web page where Helix Universal Server gets ad URLs.
5. Click **Apply**.
6. Restart Helix Universal Server by clicking the **Restart** icon at the top of the Administrator.
7. Open the previous RTSP URL in the RealNetworks player. This plays the same video, but with a banner ad pulled from the **Target HTML** URL, rather than from a RealNetworks server.

General Steps for Setting Up Ad Streaming

➤ Follow these steps to set up ad streaming:

1. Integrate Helix Universal Server with your ad serving system.

   To retrieve ad URLs, Helix Universal Server can integrate directly with many ad serving systems. It can also request an HTML page on a Web

server to get ad URLs. For more on these two methods, refer to "Getting Ad URLs from an Ad Server" on page 304.

2. Create ad streaming mount points.

   These mount points, which determine what type of ad Helix Universal Server streams, appear in URLs for requested content. "Configuring Helix Universal Server to Stream Ads" on page 310 tells how to set up the mount points and configure ad streaming features.

3. Set up automatic SMIL generation mount points (optional).

   If you have a lot of existing content for which you want to include ads, this optional feature can save you much time and effort. See "Generating SMIL Files for Ads" on page 320 for more information.

4. Communicate ad streaming features to content creators.

   Content creators refer to the ad chapter in *RealSystem Production Guide Release 8* for instructions on creating SMIL files with `<RealAdInsert/>` tags. They rely on you for information about Helix Universal Server's specific ad streaming features, however. You need to communicate the following to content creators:

   - whether automatic SMIL generation is in use
   - the ad formats available, such as GIF, animated GIF, RealVideo, or Flash
   - the width and height of available ads
   - the mount points to include in URLs used to request streaming presentations
   - the allowable mount point override options

     Note: Override options are described in "Overriding Mount Point Settings through SMIL" on page 319.

Getting Ad URLs from an Ad Server

To stream an ad, Helix Universal Server gets the URL to the ad clip (whether a static image or a streaming clip such as video) from an ad serving system. You can integrate Helix Universal Server directly with many popular ad servers. Or Helix Universal Server can get ad URLs through a Web server integrated with an ad server. Both options are described below. The location Helix Universal

Server accesses to get ad URLs is its *target URL*. Each target URL returns URLs (both the file URL and the clickthrough URL) for a specific type of ad.

Understanding Ad Types

The types of ads Helix Universal Server streams relate directly to the target URLs. To stream just one type of ad, you need just one target URL where Helix Universal Server gets all ad URLs. If you plan to stream different types of ads, such as image banner ads and streaming video clips, though, you need target URLs for each ad type. Several things determine the "ad type":

- ad file format

  A GIF or animated GIF image has a different file format than a streaming video clip. If you host both GIF and RealVideo ads, for example, you'll need at least two target URLs, one for each file format.

- ad file size

  For some presentations, you might insert full-size banner ads (468 pixels by 60 pixels). For others, you may include half-size banner ads (234 pixels by 60 pixels). You need to set up a different target URL for each ad size. Similarly, you'll need a different target URL for each size of RealVideo ad you stream.

- ad audience

  You may want to use different ads based on the subjects of your streaming presentations. Streaming sports clips may have different advertisers than streaming news stories, for example. You can use different target URLs when ads are the same size and formats, but reach different audiences.

- ad serving system

  Helix Universal Server can integrate with several ad streaming systems. Each system may work differently, however. Suppose you stream just standard banner ads, but pull the ads from two different ad serving systems. You'll need two different target URLs, one for each system, even if the ads have the same format, size, and audience.

Combinations of file format, file size, audience, and ad serving system make up the types of ads Helix Universal Server gets from target URLs. As "Understanding Ad Streaming Mount Points" on page 310 explains, the number of target URLs you use determines how many ad streaming mount points you set up.

Guidelines for Ads in Streaming Presentations

The following points and guidelines apply to ad files and ad URLs used in streaming Helix Universal Server presentations:

- A banner ad must be a GIF, animated GIF, or JPEG image. the RealNetworks player cannot display ads that are HTML tables, Java applets, and so on.
- Ad clickthrough URLs are thrown to the viewer's browser, unless the URL is a SMIL hyperlink URL that targets the RealNetworks player.
- For rotating banner ads, Helix Universal Server requests the target URL at regular intervals throughout the presentation as defined by the ad mount point. Each time it requests the target URL, the ad serving system returns a URL to a different banner ad.
- For single banner ads or streaming media ads, Helix Universal Server requests the target URL for each `<RealAdInsert/>` tag in the SMIL file. If the file has two `<RealAdInsert/>` tags, for example, Helix Universal Server requests the target URL twice and uses the ad URL returned with the first request for the first `<RealAdInsert/>` tag, the URL returned with the second request for the second tag.
- the RealNetworks player supports cookies just like a Web browser. If the Web server hosting the ad target page attempts to set a Web browser cookie through an HTTP response header, Helix Universal Server intercepts the cookie and writes it to the RealNetworks player. When the RealNetworks player requests content that includes an ad, Helix Universal Server requests from the user's Web browser any cookies for the target Web server's domain and path, forwarding these to the Web server.

  Note: the RealNetworks player users can disable cookie support in their the RealNetworks player preferences.

- You can modify your ad server to produce RTSP-based URLs to streaming media ads in RealAudio, RealVideo, and Flash formats. For more information, the ad chapter in *RealSystem Production Guide Release 8* explains how to use the `<RealAdInsert/>` tag in SMIL files.

Integrating Helix Universal Server Directly with an Ad Server

Helix Universal Server works with a number of popular ad serving systems. To integrate Helix Universal Server with the ad serving system you're using, see this document:

http://docs.real.com/docs/adapp.pdf

This document explains how to get ad URLs through HTML generated directly by different ad serving systems. Typically you do this through a target URL that causes the ad server to return the ad URLs you want. You then tie this target URL to a Helix Universal Server mount point, as described in "Creating Ad Streaming Mount Points" on page 313.

Integration information is given in this separate document, rather than this manual, so that RealNetworks can provide you with the latest information. To read this document, which is in Adobe's Portable Document Format (PDF), use the free Acrobat Reader, available here:

http://www.adobe.com/products/acrobat/readstep.html

If the integration document does not cover the ad server you're using, you can set up a target HTML page on a Web server.

Setting up a Target HTML Page on a Web Server

Integrating Helix Universal Server directly with your ad serving system is the preferred method for getting ad URLs. However, Helix Universal Server can also retrieve ad URLs by requesting an HTML page integrated with an ad serving system. This target page may be an existing Web page on your site, or a page specifically set up to provide Helix Universal Server with ad URLs. By using this page as an intermediary for exchanging ad URLs, Helix Universal Server can work with virtually any ad serving system.

You set up your HTML target page as required by your ad serving system. For example, some systems require a page to have a server-side `#include` tag that expands into ad URLs when the page is served. When Helix Universal Server requests the page, the returned page should have mark-up that includes an `<img src=...>` tag for the ad file, as well as a clickthrough hypertext link, similar to this:

```
<a href="http://www.real.com">
<img src="http://images.real.com/ads/adsalesrg.gif">
</a>
```

Helix Universal Server then replaces the requested SMIL file's `<RealAdInsert/>` tag with these URLs.

> **Note:** Refer to your ad serving system's documentation for information on how to insert ad URLs into the target HTML page each time it is requested.

Guidelines for Creating a Target HTML Page

In addition to the general points listed in "Guidelines for Ads in Streaming Presentations" on page 306, the following points apply when you get ad URLs through an HTML page hosted on a Web server:

- You can designate the ad to use by including the variable `realad="1"` in the image source tag. The `realad` value "`1`" is a syntax requirement that simply tells Helix Universal Server which image to use. Using the `realad` variable requires you to configure the ad server to include the variable in the returned HTML. Here is an example:

```
<img src="http://www.real.com/ads/nbcconan.gif" border=0
alt="Win a Great Spring Break!" realad="1">
```

- If no `realad="1"` value is present, Helix Universal Server uses the first `<img src=...>` tag in the HTML file as the ad source.

> **Warning!** If other hyperlinked images precede the desired ad image, Helix Universal Server may not be able to distinguish the correct URL to extract.

- To minimize ad streaming latency, keep the target HTML page as small as possible, serve the page from a Web server that has fast response, and ensure that the network connection between the machines is fast.

Requesting SMIL Files from an Ad Server

As described above, the target URL typically returns ad URLs that Helix Universal Server incorporates into the requested SMIL file. However, the ad server can also return a full presentation SMIL file. To set this up, you modify your ad server to generate SMIL mark-up, including a layout, ad URLs, requested clip URLs, and any other SMIL attributes. The returned SMIL file must start with `<smil>` and end with `</smil>` as shown here:

```
<smil>
  <body>
    ...all SMIL mark-up...
  </body>
</smil>
```

Helix Universal Server recognizes that the ad server has returned SMIL mark-up rather than simple ad URLs. Instead of streaming the SMIL file the RealNetworks player originally requested, Helix Universal Server streams the returned SMIL mark-up in full. The requested SMIL file just needs to be a shell for a `<RealAdInsert/>` tag:

```
<smil>
  <RealAdInsert/>
</smil>
```

The following table illustrates the basic steps involved in generating a SMIL file by an ad server. If you integrate Helix Universal Server directly with an ad server, you don't use an HTML target file as shown in column 2. Rather, the target URL causes the ad server to return the mark-up shown in column 3. Some syntax details have been omitted for clarity.

Generating SMIL Presentations with an Ad Server

SMIL File Requested by Viewer	HTML Target File Used to Expand <RealAdInsert/>	File Returned from Ad Server	SMIL File Delivered to Viewer
<smil> **<RealAdInsert/>** </smil>	**<HTML>** ... <!--#include...--> ... **</HTML>**	<smil> <body> ...*mark-up*... </body> </smil>	<smil> <body> ...*mark-up*... </body> </smil>
The requested file is a shell for <RealAdInsert/>.	The request URL points Helix Universal Server directly to an ad server, or, as shown above, to an HTML page integrated with an ad server.	The ad server returns a full SMIL file that contains mark-up for a streaming presentation.	Helix Universal Server streams the SMIL file returned by the ad server to the RealNetworks player.

Configuring Helix Universal Server to Stream Ads

Helix Universal Server can insert a banner ad, rotating banner ad, or streaming ad clip into a requested SMIL file. Content creators lay out the presentation with SMIL, but instead of including URLs to ad clips, they add `<RealAdInsert/>` tags that cause Helix Universal Server to get ads from an ad server. The URL for the SMIL file request determines what type of ad Helix Universal Server inserts in place of a `<RealAdInsert/>` tag.

Understanding Ad Streaming Mount Points

Once you've determined how many ad types you need to stream, you can plan the mount points you'll need. ("Understanding Ad Types" on page 305 explains how various factors make up an "ad type.") Each mount point gives Helix Universal Server a different target URL where it finds the ad URLs. If one type of ad, such as a GIF banner ad, works for all content you stream, set up just one ad streaming mount point, such as `/adtag/general/`. You'll probably need to set up several mount points, however.

Once you've set up the mount points, the ad used to replace a `<RealAdInsert/>` tag depends on the URL used to request the SMIL file. Here's an example of a SMIL request URL:

```
<a href="http://helixserver.example.com:HTTPport/ramgen/adtag/general/start.smil">
```

The target URL defined for the `/adtag/general/` mount point determines what type of ad replaces the SMIL file's `<RealAdInsert/>` tag or tags. `<RealAdInsert/>` tags may have parameters that override the settings, though. Additional mount points not related to ad streaming, such as a mount point to verify a user name and password, may precede an ad streaming mount point in the SMIL file request URL:

```
<a href="http://helixserver.example.com:HTTPport/ramgen/secure/adtag/general/
start.smil">
```

To stream more than one type of ad, you define additional mount points like these:

```
/adtag/sports/
/adtag/tech/
```

These mount points appear in different request URLs that target different types of ads:

```
<a href="http://helixserver.example.com:HTTPport/ramgen/adtag/sports/start.smil">
<a href="http://helixserver.example.com:HTTPport/ramgen/adtag/tech/start.smil">
```

Tip: Although you can create a new mount point for every ad type you stream, you do not always have to do this. In some cases, it is easier to use SMIL to override a mount point's settings, rather than create a new mount point. Before you set up mount points, read "Overriding Mount Point Settings through SMIL" on page 319.

Choosing the Ad Streaming Base Mount Point

Ad streaming mount points like `/adtag/general/` constitute "virtual paths" that invoke Helix Universal Server's ad streaming feature. The base mount point represents the actual file system mount point Helix Universal Server uses to find the requested file. When you define an ad streaming mount point, you also indicate its base mount point. For example, this entry for a base mount point:

```
/
```

means Helix Universal Server uses the file system plug-in associated with the mount point "/" to locate the requested file. The value "/" typically indicates Helix Universal Server's default file system plug-in that locates unsecured files on local disks. So for this request:

```
<a href="http://helixserver.example.com:HTTPport/ramgen/adtag/general/start.smil">
```

Helix Universal Server locates the file with a UNIX path such as the following, depending on the directory path associated with the "/" mount point:

```
/usr/local/Real/HelixServer/content/start.smil
```

On Windows, the path may look like this:

```
C:\Program Files\Real\Helix Server\content\start.smil
```

Using Authentication with Ad Streaming

If Helix Universal Server contains secure content, authorization is verified only on the initial request URL, not when Helix Universal Server accesses the file through the base mount point. This creates a security risk if ad streaming requests are unsecured, but secure content resides below the directory defined by the base mount point. If your Helix Universal Server hosts secure content, but ad streaming requests are unsecured, make sure the ad streaming base mount point does not lead to a secured directory.

Security Risk Example

To illustrate how a security hole can occur, suppose the ad streaming mount point uses a base mount point of "/", which is defined in the Helix Administrator's **Mount Points** section as this path:

```
.../content/
```

If this path leads to a secured directory such as:

```
.../content/protected/
```

someone can access content in this directory through the ad streaming system by using a URL such as this:

```
<a href="http://helixserver.example.com:HTTPport/ramgen/adtag/general/protected/
start.smil">
```

This URL uses the Ramgen (`/ramgen/`) and ad streaming (`/adtag/general/`) mount points, but no security mount point. Here, `/protected/` is not a mount point, but the directory below the base mount point directory. Because the URL has no security mount point, Helix Universal Server does not validate the request before accessing the file in this path:

```
.../content/protected/start.smil
```

To prevent security problems, keep unsecured and secured content in separate paths. For example, you might use these mount points for unsecured and secure content:

```
/
/secured/
```

These mount points might lead, respectively, to these paths on UNIX:

```
/usr/local/Real/HelixServer/content
/usr/local/Real/HelixServer/secure
```

or these paths on Windows:

```
C:\Program Files\Real\Helix Server\Content
C:\Program Files\Real\Helix Server\Secure
```

A security risk is not present because the unsecured directory path does not lead to the secured directory path. For information on secure directories and authenticated content, refer to Chapter 13, "Authentication".

Creating Ad Streaming Mount Points

The mount point `/adtag/general/` is predefined. You can modify this mount point, as well as create new mount points.

➤ To create a new ad streaming mount point:

1. Click **Advertising>Ad Serving**.
2. Click the "+" icon. This creates a new mount point with a predefined name.
3. In the **Edit Mount Point** box, change the new mount point name to any name you prefer. This mount point, which will appear in request URLs, should have a format similar to this:

   `/adtag/tech/`

> **Tip:** Ad streaming mount points can use names such as `/generalads/`, `/sportsads/`, and `/techads/`. But names like `/adtag/general/`, `/adtag/sports/`, and `/adtag/tech/` help Helix Universal Server to run more efficiently, and make it easier to recognize ad mount points based on the consistent presence of `/adtag/`. For more information on ad streaming mount points, see "Understanding Ad Streaming Mount Points" on page 310.

➤ To define an ad streaming mount point:

1. Click **Advertising>Ad Serving**.
2. Select a mount point in **Ad Mount Points** window.
3. For **Description**, type any phrase that describes the ad mount point. You might use "Sports Ads" or "Tech Ads," for example.
4. In the **Base Mount Point** field, specify the mount point where Helix Universal Server locates the requested file. For unsecured content, this is typically the mount point "/".

> **For More Information:** See "Choosing the Ad Streaming Base Mount Point" on page 311 for more information.

5. For **Target HTML**, enter a fully-qualified target URL where Helix Universal Server finds the ad URL to use. Each ad mount point typically has a unique URL through which it directly integrates with an ad serving system, or requests a Web-based HTML page containing ad URLs. After you click **Apply** to update Helix Universal Server, **Test URL** links your

browser to the given URL. For more information, see “Getting Ad URLs from an Ad Server” on page 304. See also “Overriding Mount Point Settings through SMIL” on page 319 for details on overriding where Helix Universal Server gets ad URLs.

6. The **Ad Server Type** pull-down list lets you select the type of system that supplies the ad URLs. Your Helix Universal Server offers the following, and possibly more, choices:
   - Default
   - Type 1
   - Type 2
   - DoubleClick
   - NetGravity
   - Engage
   - AdForce

   The **Ad Server Type** setting affects the clickthrough URL of an ad that appears in the RealNetworks player. If you use the DoubleClick ad serving system, for example, choose the **DoubleClick** option. When you choose one of the named ad serving systems, make sure you have integrated Helix Universal Server with that system as described in “Integrating Helix Universal Server Directly with an Ad Server” on page 307.

   If you do not use one of the named ad serving systems, choose the **Default** setting and finish configuring the mount point as described in this section. Apply the changes, and use the RealNetworks player to request ad content through the mount point. Click the ad to verify that it takes you to the correct Web page for the ad sponsor. If the clickthrough does not work, choose **Type 1**, apply the changes, and try again. If that doesn’t work, redo the procedure using **Type 2**. Once clickthroughs work, choose the same type setting for all mount points used with that ad serving system. For more information on this option, see “Why are There Different Ad Server Types?” on page 315.

7. Most users should leave **Resolve Relative URLs** set to **Yes**. In this case, Helix Universal Server resolves any relative ad URLs, sending fully qualified URLs to the RealNetworks player. This prevents the RealNetworks player from mistakenly requesting content from the wrong server. This setting does not affect fully qualified URLs returned to Helix Universal Server.

Set **Resolve Relative URLs** to **No** only if your Helix Universal Server hosts the content specified by relative ad URLs. For example, your Helix Universal Server might host the GIFs used for rotating banner ads. The ad serving system can then return relative URLs that Helix Universal Server sends to the RealNetworks player. In this case, Helix Universal Server doesn't need to resolve the relative URLs because it hosts the content.

8. Enter information in the **Rotating Banner Ads** section if you want to set up rotating banner ads. The section "Setting Up Rotating Banner Ads" on page 316 explains these fields in detail.
9. Click **Apply** to update Helix Universal Server with the new mount point information.
10. Put the changes into effect by clicking the **Restart** icon at the top of Helix Administrator.

Why are There Different Ad Server Types?

For the **Ad Server Type** field, Helix Universal Server presents several name-brand ad serving systems, as well as the three generic options: **Default**, **Type1**, and **Type 2**. These options are present because different ad serving systems handle clickthrough URLs differently. Some ad serving systems return the advertiser's clickthrough URL with the ad image URL. For example, a clickthrough URL **http://www.real.com** may accompany a RealNetworks ad.

Other ad servers do not return the advertiser's clickthrough URL initially, however. Instead, they record Helix Universal Server's IP address and a user agent ID when it requests an ad. Rather than pointing to the advertiser's Web site, the clickthrough URL points back to the ad server and includes Helix Universal Server's IP address and ID. This type of URL lets the ad server log the clickthrough before redirecting the request to the advertiser's Web site.

In this case, an error may occur on the ad server because the RealNetworks player handles clickthroughs rather than Helix Universal Server. the RealNetworks player's IP address will not match Helix Universal Server's IP address, so the ad server will not recognize the RealNetworks player as the client that received the ad. To correct this, the RealNetworks player routes the clickthrough request through Helix Universal Server. Because Helix Universal Server then acts as the RealNetworks player's proxy, the ad server recognizes the clickthrough attempt.

The settings **Default**, **Type 1**, and **Type 2** cover three possible ways that Helix Universal Server can interact with ad servers. It is easier to try out the three

possibilities until you find that option that makes clickthroughs work correctly than to research how your ad serving system handles clickthroughs.

Setting Up Rotating Banner Ads

When you set up a mount point to stream banner ads in JPEG or GIF format, you can use Helix Universal Server's rotation feature to insert fresh ads into the SMIL presentation at regular intervals. You might stream a new ad image to the RealNetworks player every 30 seconds, for example. The following are the options you set in the **Rotating Banner Ads** section of the ad streaming mount point dialog. For more on SMIL generation, see "Generating SMIL Files for Ads" on page 320.

Rotate

Select **On** in this pull-down list to turn on banner ad rotation for the mount point.

Interval

This is the frequency in seconds that new banner ads appear in the RealNetworks player. Make sure that the interval and the bit rate work for the ad size. With a bit rate of `1000` and an interval of `30`, for example, Helix Universal Server can stream 30,000 bits (3.6 Kilobytes) during each 30-second interval. This may not be enough for some banner ads.

Bitrate

Helix Universal Server streams banner ads to the RealNetworks player at this rate, which is in bits per second (bps). Keep in mind that the ad bit rate is part of the presentation's overall bit rate. If you want to deliver a 20 Kbps video over 28.8 Kbps modems, for example, do not use a 4000 bps ad stream. The total presentation bit rate of 24 Kbps is too high when you take into account the overhead reserved for network congestion, packet loss, and so on.

The following table lists some common interval times and banner ad sizes, showing the *minimum* bit rate required for each combination. For instance, the

table shows that 9-Kilobyte ads rotated every 30 seconds need to stream at a minimum of 2460 bits per second.

Minimum Ad Bit Rate Needed for Specific Intervals and Ad Sizes

Interval	Bit Rate for 6-Kilobyte Ads	Bit Rate for 9-Kilobyte Ads	Bit Rate for 12-Kilobyte Ads	Bit Rate for 18-Kilobyte Ads
15	3280	4920	6560	9840
30	1640	2460	3280	4920
45	1100	1640	2200	3280
60	820	1230	1640	2460
90	550	820	1100	1640
120	410	620	820	1240

Note: The bandwidth chapter in *RealSystem Production Guide Release 8* explains how to target various connection speeds.

Startup Image

In this optional field, you can enter the location of an image to display before the first ad streams to the RealNetworks player. The purpose is simply to fill the ad banner region until the first ad appears in the RealNetworks player. If you don't use a start-up image, the ad region remains blank until the first ad arrives. The start-up image streams at the same bit rate you select for the rotating ads. Do the following to make the start-up image appear as quickly as possible:

- Keep the start-up image as small as possible. The image should be a small, non-animated GIF or JPEG.
- Stream the start-up image from Helix Universal Server rather than another server. Although not required, this minimizes delays caused by connection latency. If a start-up image named `start.gif` is in Helix Universal Server's main content directory, for example, enter this for **StartUp Image**:

  ```
  /start.gif
  ```

Changing Timeout Values

Helix Universal Server uses two timeout values, each set by default to 5 seconds:

- Connection Timeout

  This value determines the number of seconds that Helix Universal Server waits for a response from an ad serving system or a Web server when requesting ad URLs.

- Server Timeout

  This value determines the number of seconds that Helix Universal Server waits for the ad server or Web server to return the ad URLs after the connection is made.

All timeouts are recorded in the Helix Universal Server error log. (The error log is described in "Error Log" on page 330.) If ads consistently fail to appear in the RealNetworks player, the server providing the ad URLs may not be responding fast enough to avoid a timeout. You should first try to fix this latency by using a faster Web or ad server, or increasing the speed of the connection between Helix Universal Server and the other server. If ad retrieval still times out, increase the two timeout values by increments of one second until ad retrieval consistently works. Consider the following points when raising the timeout values:

- The higher the timeout value, the longer Helix Universal Server waits for a response and, correspondingly, delays the presentation. You need to balance the requirements for retrieving ads against viewers' expectations that presentations play back with minimal delay.
- In its preferences, each the RealNetworks player has a connection and a server timeout period set by default to 20 and 90 seconds, respectively. These values determine how long the RealNetworks player waits for Helix Universal Server to respond to its requests. Your Helix Universal Server timeout values should always be below these values. Each the RealNetworks player user can change these values, so some users may have set the values lower.

➤ To change the Helix Universal Server timeouts:

1. Click **Advertising>Ad Timeouts**.
2. Change the value in the **Connection Timeout** or **Server Timeout** field, or both. Do not set a value lower than the default of 5. Do not set a value higher than necessary to ensure that ad retrieval works consistently.
3. Click **Apply** to update Helix Universal Server with the new timeout information.

4. Put the changes into effect by clicking the **Restart** icon at the top of Helix Administrator.

Overriding Mount Point Settings through SMIL

Helix Universal Server lets content creators override certain ad mount point settings. Through SMIL, content creators can specify banner ad rotation parameters, as well as where Helix Universal Server gets ad URLs. If your Helix Universal Server hosts clips for many content creators who use different ad types, this override feature lets you satisfy the creators' different needs without setting up separate ad streaming mount points for each ad type. For example, instead of setting up different banner ad mount points for different audiences, you can set up one mount point, then use SMIL to point Helix Universal Server to different target URLs. Each target URL then returns ad URLs for a different audience.

Overriding the Target URL Location

As described in "Creating Ad Streaming Mount Points" on page 313, you specify where Helix Universal Server gets ad URLs when you define each ad streaming mount point. Helix Universal Server then requests an ad URL for each `<RealAdInsert/>` tag included in the SMIL file. Content creators can specify a different target that provides ad URLs, however, by including an `AdURL` attribute in the `<RealAdInsert/>` tag:

```
<RealAdInsert region="adbanner" AdURL="http://www.example.com/ads.html"/>
```

In this case, Helix Universal Server requests the URL specified by the `AdURL` attribute, not the target defined through **Target HTML** in the mount point dialog. Keep in mind, though, that the `AdURL` target must provide ad URLs that work with the mount point's remaining settings. For example, the `AdURL` target should not return URLs to streaming video ads if the mount point is set up for rotating banner ads. Nor should it target an ad serving system other than the one defined for the mount point.

Overriding Banner Rotation Settings

"Setting Up Rotating Banner Ads" on page 316 explains how to configure an ad streaming mount point for rotating banner ads. To include these ads in a SMIL presentation, content creators use a `<RealAdInsert/>` tag like this:

```
<RealAdInsert region="ad_banner" dur="9min"/>
```

This tag specifies the SMIL region where the ads appear and how long Helix Universal Server sends ads to the RealNetworks player. Normally, the tag does not specify any ad rotation parameters, which are set instead in the ad streaming mount point. As described above, however, content creators can specify where Helix Universal Server gets the banner ad URLs. As well, content creators can override any of the banner ad mount point's **Interval**, **Bitrate**, and **Startup Image** settings:

```
<RealAdInsert region="ad_banner" dur="9min" Interval="60" Bitrate="2460"
StartupImage="/start.gif" AdURL="http://www.example.com/ads.html"/>
```

This sample tag overrides the ad mount point's rotation settings with a new ad target URL, a new start-up image, a rotation interval of 60 seconds, and a bit rate of 2,460 bits per second.

Generating SMIL Files for Ads

Helix Universal Server can automatically generate a SMIL file that inserts an ad or series of ads in each streaming presentation. This works for both single clips and existing SMIL files. If your Helix Universal Server hosts a large number of RealAudio clips, for example, you can simply have Helix Universal Server generate a SMIL file that lays out ads for each clip. Content creators then do not need to write SMIL files or include `<RealAdInsert/>` tags in existing SMIL files.

> **Note:** Automatic SMIL generation works in conjunction with ad streaming as described in "Configuring Helix Universal Server to Stream Ads" on page 310, and you must set up ad streaming mount points first.

Limitations on Automatic SMIL Generation

Although automatic SMIL generation works in a large number of ad streaming scenarios, it does not provide all the flexibility possible when content creators write SMIL files that include `<RealAdInsert/>` tags. SMIL generation has these limitation:

- Each requested clip or SMIL file can include only one ad. You can have a rotating banner ad that refreshes every 30 seconds, for example, but you cannot have two banner ads.
- Interstitial ("commercial break") ads are not supported.

- With rotating banner ads, Helix Universal Server assumes the generated SMIL file is for a live broadcast, and it disables the RealNetworks player's clip position slider. For more on this, see the section on rotating banner ad durations in the ad chapter of *RealSystem Production Guide Release 8*.
- Content creators cannot change ad streaming mount point parameters as described in "Overriding Mount Point Settings through SMIL" on page 319.

Understanding SMIL Generation Mount Points

Like ad streaming, automatic SMIL generation works through mount points included in the content request URL. The SMIL generation mount points always work in tandem with ad streaming mount points, which are described in "Understanding Ad Streaming Mount Points" on page 310. For example, a Web page hyperlink to a media clip or SMIL file on Helix Universal Server may look like this:

```
<a href="http://helixserver.example.com:HTTPport/ramgen/adtag/general/
smilgen/banner/video/video.rm">
```

Here, the ad streaming mount point, `/adtag/general/`, determines the type of ad used with `video.rm`. The SMIL generation mount point, `/smilgen/banner/`, trails the ad streaming mount point in the URL. It causes Helix Universal Server to create a SMIL file that lays out a `<RealAdInsert/>` tag along with the video clip. If a SMIL file rather than a clip were requested, Helix Universal Server would create a new SMIL file that includes the contents of the requested SMIL file along with a `<RealAdInsert/>` tag.

A mount point such as `/smilgen/banner/` might define a layout for a banner ad that is 468 pixels wide by 60 pixels high and appears above the requested content. You can define any number of SMIL generation mount points, such as `/smilgen/lead_in/` or `/smilgen/banner_below/`, for different ad layouts. This lets you support any number of ad types, whether banner ads or streaming media ads, through SMIL generation.

When you define a SMIL generation mount point, it must be relative to the base mount point of the ad streaming mount point used with it. For example, in this request URL:

```
<a href="http://helixserver.example.com:HTTPport/ramgen/adtag/general/smilgen
/banner/video/video.rm">
```

/adtag/general/ is the ad streaming mount point. If this mount point uses the default file streaming mount point ("/") as its base mount point, you simply define the SMIL generation mount point like this:

```
/smilgen/banner/
```

If the ad streaming mount point uses a base mount point such as /local/, however, you need to include this base mount point in the SMIL generation mount point definition:

```
/local/smilgen/banner/
```

This causes the SMIL generation feature to intercept the file access attempt caused by the ad streaming mount point. The actual file access then occurs through the SMIL generation mount point's base mount point. Note that in the example above, /local/ does not appear in the request URL. It appears only in the SMIL generation mount point dialog. For more on the ad streaming base mount points, see "Choosing the Ad Streaming Base Mount Point" on page 311.

Creating SMIL Generation Mount Points

SMIL generation mount points for lead-in ads, banner ads, and rotating banner ads are predefined. You can modify these mount points or create new ones.

➤ To create a SMIL generation mount point:

1. Click **Advertising>Ad SMIL Generator**.
2. Click the "+" icon. This creates a new mount point with a predefined name.
3. In the **Edit Mount Point** field, change the new mount point name to any name you prefer. This mount point, which will appear in request URLs, should have a format similar to this:

   ```
   /smilgen/banner_above/
   ```

   > **Tip:** SMIL generation mount points can use names such as /smil_lead/ and /smil_banner/. But names like /smilgen/lead_in/ and /smilgen/banner_below/ help Helix Universal Server to run more efficiently, and make it easier to recognize mount points based on the consistent presence of /smilgen/. Remember that SMIL generation mount points are relative to ad streaming

base mount points. See “Understanding SMIL Generation Mount Points” on page 321.

➤ To edit a SMIL generation mount point:

1. Highlight the mount point in the **SMIL Mount Points** window.
2. For **Description**, enter a phrase that describes the ad mount point. You might use “Bottom Banner SMIL Generation” or “Lead-in Video SMIL Generation,” for example.
3. In the **Base Mount Point** field, enter the mount point where Helix Universal Server locates the requested file. For unsecured content, this is typically the mount point “/”.

   Note: SMIL generation base mount points have the same security issues related to the base mount points for ad streaming. See “Using Authentication with Ad Streaming” on page 311 for more information.

4. Fill in the options for SMIL generation in the remainder of the dialog. See “Setting SMIL Options” on page 323 for descriptions of these options.
5. Click **Apply** to update Helix Universal Server with the new mount point configuration.
6. Put the changes into effect by clicking the **Restart** icon at the top of Helix Administrator.

Setting SMIL Options

The following are the SMIL generation options you can set for each mount point.

Ad Type

This pull-down list determines the type of ad used. You can set one of these values:

`Banner`	Banner ad that appears alongside requested content. For **Ad Position**, choose `Top`, `Bottom`, `Left`, or `Right`.

`Leadin`	Ad that appears before the requested content begins playback. This ad is usually in a format such as RealVideo or Flash. The **Ad Position** value is typically `Center`.
Rotating Banner	Rotating banner ad that appears alongside requested content. The **Ad Position** value should be `Top`, `Bottom`, `Left`, or `Right`.

Ad Position

This pull-down list determines the ad's location relative to the requested content. It can have one of the following values:

`Top`	Ad appears above the requested content. The ad and content are centered horizontally within the RealNetworks player window.
`Bottom`	Ad appears below the requested content. The ad and content are centered horizontally within the RealNetworks player window.
`Center`	Ad appears centered and in front of the requested content. The ad and content are thus centered both horizontally and vertically. In this case, the **Ad Type** value should be `Leadin`. Otherwise the ad appears in front of the content as the content plays.
`Left`	Ad appears to the left of the requested content. The ad and content are centered vertically within the RealNetworks player window.
`Right`	Ad appears to the right of the requested content. The ad and content are centered vertically within the RealNetworks player window.

Ad Width and Ad Height

In these fields, set the pixel width and height, respectively, of the ad included with the request. Helix Universal Server uses these values to lay out the ad in the SMIL file. Make sure that the ad serving system returns URLs to ads of this size. For more information, see "Getting Ad URLs from an Ad Server" on page 304.

Inner Padding and Outer Padding

The outer padding determines how many pixels of space Helix Universal Server adds as a border around all clips. A value of `20`, for example, adds 20 pixels of outer padding. The inner padding sets the distance in pixels between the ad and the requested content. It is ignored if the ad is centered in front of the requested content.

Suppose a banner ad appears above the content and is wider than the content. If the ad is 468 pixels wide, an outer padding value of 5 makes the RealPlayer window 478 pixels wide. The height of this window is:

- the height of the ad
- plus the height of the content (height of clip or SMIL file `root-layout`)
- plus the `InnerPadding` value
- plus 10 pixels (5 pixels of outer padding at top and bottom)

Background Color

This field sets the background color for the RealNetworks player window. Empty space around the ad and content appears in this color. To specify a color value, use any RGB hexadecimal value (`#RRGGBB`), or one of the following predefined color names, listed here with their corresponding hexadecimal values:

`white (#FFFFFF)`	`silver (#C0C0C0)`	`gray (#808080)`	`black (#000000)`
`yellow (#FFFF00)`	`fuchsia (#FF00FF)`	`red (#FF0000)`	`maroon (#800000)`
`lime (#00FF00)`	`olive (#808000)`	`green (#008000)`	`purple (#800080)`
`aqua (#00FFFF)`	`teal (#008080)`	`blue (#0000FF)`	`navy (#000080)`

Enable Playlist

This field determines whether the viewer has access to the RealNetworks player playlist during a lead-in ad. It does not affect banner ads. Set this field to `Yes` to allow the viewer to skip the lead-in ad clip.

PART VII

LOGGING AND MONITORING

This section deals with compiling statistics, creating reports, and monitoring network connections. You can create real-time reports about media streamed by Helix Universal Server, for example, or just compile error messages in a simple log file.

CHAPTER

16

ACCESS AND ERROR LOGS

This chapter explains how Helix Universal Server records information about client connections and other events. Using the log files, you can compile reports about system activity, gathering the statistical information you need.

> **Tip:** If you're interested in designing custom reports to track specific activities on Helix Universal Server, refer to Chapter 17.

Understanding Log Files

Helix Universal Server maintains an access log that includes statistics about client connections. It keeps another log of error and informational messages about Helix Universal Server operation. The log files are text files that you can open with any text editor, or parse with a script or application. As accesses or errors occur, Helix Universal Server appends information to the end of the appropriate log file. The following sections introduce you to the log files and their features.

Access Log

The access log records information about requests by RealNetworks media players, Windows Media Player, and QuickTime Player, as well as browser requests for Helix Administrator pages. Using these logs, you can find out what clips were played, the times when media players connected, and so on. This information can help you determine which clips are most popular, for example.

The default access log is `rmaccess.log`, which is located in the `Logs` subdirectory of the main Helix Universal Server installation directory. However, information about which authenticated files have been accessed is stored in `reglog.txt` and `accesslog.txt`, which are described in "Logs Directory" on page

394. Requests for streams that will be cached are stored in the cached requests log.

Logged Information

Helix Universal Server provides six logging styles that determine the amount of information gathered on each access attempt. In general, each style builds on the preceding style, adding more information. For instance, logging style 0 gathers the least amount of information. Logging style 1 includes the style 0 information, and adds more information, and so forth. You choose just one logging style for the entire log.

For More Information: The section "Access Log File Format" on page 334 explains the logging styles and information fields.

Media Player Statistics

All logging styles can record statistics about a media player's playback experience. These statistics let you learn how many media packets were dropped, for instance, or whether the viewer paused the clip. There are four types of client statistics. You can use any combination of these statistics types, up to all four. Or, you can turn off client statistics gathering entirely. As well, users may choose not to report statistics.

For More Information: See "Client Statistics" on page 346.

Error Log

The error log contains information and error messages about Helix Universal Server operation. By looking for patterns of errors, you can troubleshoot and correct possible problems on your site. The default file name is `rmerror.log`, and the file is generated in the `Logs` subdirectory of the main Helix Universal Server installation directory. Helix Universal Server records an entry in this log only when an error occurs. Until an error happens, the file does not exist. The error log uses the following syntax:

```
***date time servername(process_ID): error_message
```

The following table explains these fields in the error log file.

Error Log Fields

Entry	Meaning
`***`	Three asterisks indicate an error. Informational messages are not preceded by asterisks.
`date`	Date on which the error occurred, given in the form `dd-Mmm-YY`, as in `26-Apr-02`.
`time`	Time the error occurred on the Helix Universal Server clock, given in the form `HH:MM:SS.xyz`, as in `21:05:10.614`.
`servername(process_ID)`	Helix Universal Server name, followed by the process ID in parentheses.
`error_message`	Text of the message.

Note: If you receive a message that refers to a fatal error, contact the RealNetworks Technical Support Department for assistance.

Log File Rolling

The access and error log files can grow indefinitely as they accumulate data. To keep log files manageable, you can limit a log file to a specific size. With the access log, you can also create a new log at a preset interval, such as every six hours or two weeks, depending on the amount of data you expect to log. Helix Universal Server begins, or *rolls*, a new log file when the limit is reached. Rolled log files are named with the following format:

file_name`.log.`*timestamp*

The name and extension are set through Helix Administrator, as described in "Customizing the Access and Error Logs" on page 353. The timestamp has the following format, using a 24-hour clock:

`YYYYMMDDHHMMSS`

For example, the following file was created on June 22, 2002, at 1:49.53 P.M:

`rmaccess.log.20020622134953`

Access Log Used with Other Features

The following sections describe how information about various features appears in the access log file.

Helix Universal Proxy

If clips are proxied, the access log provides additional information about the connection. For more information, see "Proxied Clip Information" on page 343.

Live Unicasting

Clients transmit data for live events at the conclusion of a broadcast. Entries will not appear in the access log until the live event is over, or the user clicks **Stop**. As described in "GET Statements" on page 343, the `GET` statement shows unicasted events starting with the live mount point (usually `/broadcast/` or `/encoder/`). Statistics type 3, which show user actions such as fast forward and pause, are not available for live events.

SLTA

If you broadcast a prerecorded clip in an infinite loop using SLTA, and the client remains connected, no access record is created until the broadcast stops or the client halts.

Splitting

On transmitters, the access log does not show any records pertaining to the receiver connections. However, if the same event is transmitted to multiple Helix Universal Servers, records will be created in the transmitter's access log. On receivers, the access log contains records for each clip delivered, and shows the splitting mount point.

Back-Channel Multicasts

Clips that were broadcast using back-channel multicasts can be identified with the *protocol* statement, which will be either `PNAM` or `RTSPM`. The same clip delivered over unicast will show `PNAT` or `RTSPT` if the TCP transport was used, or `PNA` or `RTSP` if UDP was used. For more information, see "File Name and Protocol" on page 337.

Scalable Multicasts

To prevent large, scalable multicasts from overwhelming Helix Universal Server when statistics are sent, collect statistics with a Web server designed to handle large numbers of HTTP posts simultaneously. See "Gathering Client Statistics" on page 150 for instructions on configuring this feature.

Access Control and Authentication

The access log does not show whether access control rules are in use. Only clients with IP addresses approved by the access control rules, and that

supplied the proper name and password (if required) are allowed to receive content. Authenticated content is identified by the /secure/ mount point in the path shown in the GET statement. For more information, see "GET Statements" on page 343.

ISP Hosting

You can identify which on-demand files were served by the ISP hosting feature by comparing the file name in the GET statement to the /path/ value in the user list file.

Monitoring

The Server Monitor shows files that are being viewed presently, whereas the access log provides a historical report of files that have been served. All of the files that Server Monitor shows will appear in the access log when they finish playing.

Helix Administrator

The access log file shows all files served by Helix Universal Server, including all Helix Administrator pages. These appear in the GET statement and begin with admin. For more information, see "GET Statements" on page 343.

When the logging style is 5, the end of each record gives a presentation ID. For Helix Administrator pages, this number associates the elements on a particular page. All of the images that go with each page also appear in the access log. All files served that are related to a particular page are numbered sequentially.

SMIL files

Each file in a SMIL presentation, including the SMIL file itself, generates a record in the access log. When the logging style is 5, all files have the same ID number. For example, the files presentation.smil, presentation.rt, presentation.rp, and presentation.rm all have the same number in the presentation_ID field, such as 432. If the SMIL file was requested through a URL that used Ramgen, an additional record is created for the Ramgen statement, and shows a different value for the presentation_ID field.

Ram Files

All of the files listed in a Ram file generate a record in the access log. Because Ram files may be served by a Web server, there may be no record created in the access log for the Ram file. When the logging style is 5, all of the files listed in a Ram file have the same presentation_ID number.

Access Log File Format

Helix Universal Server records each access request in a separate record written to a new line in the access log. Fields within a record are separated by spaces or by pipes (|). At least one record is created for every clip served. If the client requests a presentation that includes several clips, one record is created for each clip in the presentation. Two records are created for every proxied clip delivered by proxy pull-split or cache.

Logging Style

Helix Universal Server provides six logging styles, numbered 0 through 5. Styles 1 through 4 each include the information of lower logging styles. For example, style 3 collects the same information as styles 0, 1, and 2, as well as some additional information. The default is style 5, which adds a `presentation_ID` field to the information in style 2. The following sections describe which fields each logging style collects. The section "Access Log Fields" on page 336 explains the information logged in each field.

> **Tip:** Although square brackets in syntax typically indicate optional material, the square brackets shown in the following access log syntax actually appear in the access log records.

> **Note:** In the following examples, client statistics are not logged, so each entry shows [UNKNOWN] where the statistics fields would be. If you collect client statistics, therefore, each log entry will contain additional information. For more information, see "Client Statistics" on page 346.

Logging Style 0

Logging style 0 uses this format:

```
IP_address - - [timestamp] "GET filename protocol/version" HTTP_status_code
bytes_sent [client_info] [client_stats_results]
```

Here is an example of an actual log record, showing that 858,636 bytes of the requested clip were sent over RTSP:

```
207.188.7.125 - - [26/Jun/2002:10:31:44 -0700] "GET real9video.rm RTSP/1.0"
200 858636 [WinNT_5.0_6.0.10.714_RealPlayer_RN92PD_en_686] [UNKNOWN]
```

Logging Style 1

Logging style 1 follows this format:

```
IP_address - - [timestamp] "GET filename protocol/version" HTTP_status_code
bytes_sent [client_info] [client_stats_results] file_size file_time sent_time resends
failed_resends
```

The following sample log record shows the same information as logging style 0, but adds information on file size, clip timeline length, actual time streamed, and resent packages:

```
207.188.7.125 - - [26/Jun/2002:10:06:33 -0700] "GET real9video.rm RTSP/1.0"
200 858636 [WinNT_5.0_6.0.10.714_RealPlayer_RN92PD_en_686] [UNKNOWN]
926322 217205 1 0
```

Logging Style 2

This is the format for logging style 2, which is identical to style 1, except that it records a client ID, which may be a global ID or an ID set through a cookie:

```
IP_address - - [timestamp] "GET filename protocol/version" HTTP_status_code
bytes_sent [client_info] [client_ID] [client_stats_results] file_size file_time
sent_time resends failed_resends
```

Here is an example:

```
207.188.7.125 - - [26/Jun/2002:10:07:42 -0700] "GET real9video.rm RTSP/1.0"
200 858636 [WinNT_5.0_6.0.10.714_RealPlayer_RN92PD_en_686]
[8e07b707-19b7-448b-96b6-96c90151f2a6] [UNKNOWN] 926322 217 205 1 0
```

Logging Style 3

Logging style 3 follows this format. It builds on style 2 by adding information about the streams and the Helix Universal Server that delivered the clip:

```
IP_address - - [timestamp] "GET filename protocol/version" HTTP_status_code
bytes_sent [client_info] [client_ID] [client_stats_results] file_size file_time
sent_time resends failed_resends [stream_components] [start_time] server_address
```

This example shows the server and stream information added to the end of the record:

```
207.188.7.125 - - [26/Jun/2002:10:09:09 -0700] "GET real9video.rm RTSP/1.0"
200 858636 [WinNT_5.0_6.0.10.714_RealPlayer_RN92PD_en_686]
[8e07b707-19b7-448b-96b6-96c90151f2a6] [UNKNOWN] 926322 217 205 1 0
[1 1 0 0] [26/Jun/2002:10:05:14] 208.147.89.157
```

Logging Style 4

Logging style 4 adds information about the clip's average bit rate and number of packets sent:

```
IP_address - - [timestamp] "GET filename protocol/version" HTTP_status_code
bytes_sent [client_info] [client_ID] [client_stats_results] file_size file_time
sent_time resends failed_resends [stream_components] [start_time] server_address
average_bitrate packets_sent
```

Here is an example:

```
207.188.7.125 - - [26/Jun/2002:10:10:04 -0700] "GET real9video.rm RTSP/1.0"
200 858636 [WinNT_5.0_6.0.10.714_RealPlayer_RN92PD_en_686]
[8e07b707-19b7-448b-96b6-96c90151f2a6] [UNKNOWN] 926322 217 205 1 0
[1 1 0 0] [26/Jun/2002:10:05:14] 208.147.89.157 34816 488
```

Logging Style 5

Logging style 5, which is the default style, does not build on the preceding styles. Instead, it copies style 2 and adds a presentation ID that helps you keep track of presentations that contain multiple clips:

```
IP_address - - [timestamp] "GET filename protocol/version" HTTP_status_code
bytes_sent [client_info] [client_ID] [client_stats_results] file_size file_time
sent_time resends failed_resends presentation_ID
```

The following is an example of a logging style 5 entry:

```
207.188.7.125 - - [26/Jun/2002:10:11:03 -0700] "GET real9video.rm RTSP/1.0"
200 858636 [WinNT_5.0_6.0.10.714_RealPlayer_RN92PD_en_686]
[8e07b707-19b7-448b-96b6-96c90151f2a6] [UNKNOWN] 926322 217 205 1 0 124
```

Access Log Fields

The following table summarizes the various logging fields that may appear in an access record, and indicates which logging styles include the fields. The following sections describe the access log fields in detail.

Access Log Fields

Log Field	Logging Styles	Reference
IP_address	0, 1, 2, 3, 4, 5	page 337
[timestamp]	0, 1, 2, 3, 4, 5	page 337
"GET filename protocol/version"	0, 1, 2, 3, 4, 5	page 337
HTTP_status_code	0, 1, 2, 3, 4, 5	page 338
bytes_sent	0, 1, 2, 3, 4, 5	page 338
[client_info]	0, 1, 2, 3, 4, 5	page 338
[client_ID]	2, 3, 4, 5	page 339

(Table Page 1 of 2)

Access Log Fields (continued)

Log Field	Logging Styles	Reference
[client_stats_results]	1, 2, 3, 4, 5	page 341
file_size	1, 2, 3, 4, 5	page 341
file_time	1, 2, 3, 4, 5	page 341
sent_time	1, 2, 3, 4, 5	page 341
resends	1, 2, 3, 4, 5	page 341
failed_resends	1, 2, 3, 4, 5	page 341
[stream_components]	3, 4	page 342
[start_time]	3, 4	page 342
server_address	3, 4	page 342
average_bitrate	4	page 342
packets_sent	4	page 342
presentation_ID	5	page 342

(Table Page 2 of 2)

IP Address

The IP_address field gives the IP address of client, such as 123.45.123.45. If media is being proxied to the client, the log displays the IP address of the proxy. For more information, see “Proxied Clip Information” on page 343. Following the IP address are two hyphens for compatibility with standard Web server log formats.

Timestamp

The [timestamp] field indicates the time that the client accessed the file according to the Helix Universal Server clock. It uses the following format:

```
[dd/Mmm/yyyy:hh:mm:ss TZ]
```

Here, TZ is the time zone expressed as the number of hours relative to the Coordinated Universal Time (Greenwich, England). For example:

```
[26/Jun/2002:10:10:04 -0700]
```

File Name and Protocol

The "GET filename protocol/version" field lists the file name and path requested by the client. The path is everything in the URL after the port number. If the client requests a file that doesn’t exist, UNKNOWN appears in place of the file name. Possible values for the application-layer protocol used to send the clip

to the client are RTSP, PNA, MMS, and HTTP. In addition, a letter at the end of the string indicates which transport type was used:

(blank)	UDP connection
T	TCP connection
H	HTTP connection
M	Multicast

For example, RTSPT means that the clip was streamed using the RTSP protocol over a TCP connection. The version number indicates the edition of the protocol.

For More Information: See "GET Statements" on page 343.

HTTP Status Code

The HTTP_status_code field holds a return code that uses the HTTP standard error codes. It usually returns 200.

Bytes Sent

The bytes_sent field records the number of bytes transferred to the client. If the media is being proxied to the client using proxy cache or pull splitting, the log displays this field in two records for each client connection, as described in "Proxied Clip Information" on page 343.

Client Information

The [client_info] field describes the version and type of client being used.

RealNetworks Clients

For RealNetworks clients, [client_info] uses the following format:

[*platform_version_client_type_distribution_language_CPU*]

The following information is recorded:

platform	Operating system client software runs on, such as WinNT, Mac, and so on.
version	Operating system version number.
client	Version number of the client software.
type	Type of client software.
distribution	Distribution code of the client software.

language	Language setting in client software.
CPU	Type of processor on which the client is running. If the processor does not have a hardware Floating Point Unit, the string `no-FPU` is appended to the end of the CPU field with no delimiter.

For example:

```
[WinNT_5.0_6.0.10.714_RealPlayer_RN92PD_en_686]
```

> **Note:** RealAudio Player 1 logs just two fields for `[client_info]`. They are *platform* and *client*.

Windows Media Player

For Windows Media Player, the `[client_info]` field records the player version like this:

```
[NSPlayer/7.1.0.3055]
```

QuickTime Player

For QuickTime Player, the client information records the player version and the operating system. For example:

```
[QTS (qtver=5.0.2;os=Windows NT 5.0)]
```

Unknown Clients

If client information can't be gathered because the request came from a client that chose not to send statistics, or from a browser requesting Helix Administrator pages, `[UNKNOWN]` appears in the `[client_info]` field.

Proxied Media

If media is proxied to the client, the log displays, at a minimum, the version and type of the proxied client. For media delivered by proxy pull splitting or cache, `RealNetworks Broadcast Receiver` or the Helix Universal Proxy version and type appear in an additional record. For example:

```
[linux-2.2-libc6-i586-server_RealProxy_9.0.2_RealNetworks]
```

> **For More Information:** See "Proxied Clip Information" on page 343.

Client Identifier

For `[client_ID]`, the access log can record an identification number for each media player. This may be a globally unique ID. For RealNetworks clients, it may be an ID based on a cookie. The following sections explain the possible field entries. The default settings for Helix Universal Server and RealNetworks

clients record a cookie-based ID for each client access attempt. Users can control whether IDs are transmitted and cookies are accepted, however. As well, you can disable the logging of GUIDs and the setting of cookies through Helix Universal Server regardless of client configurations.

> **For More Information:** See "Modifying the Access Log" on page 353 for instructions on turning off client ID logging.

Globally Unique Identifier (GUID) for RealNetworks Client

If a RealNetworks client is configured to send a globally unique ID, it does so. For privacy protection, however, RealOne Player is set by default *not* to send a GUID. Because sending a GUID rests solely at the discretion of each user, users must change their default GUID settings for their GUIDs to appear in the access logs. In RealOne Player, the user command for controlling GUID reporting is **Tools>Preferences> Connection>Internet Settings**.

> **For More Information:** To review RealNetworks' Consumer Software Privacy Statement, see the Web page located at **http://www.realnetworks.com/company/privacy/software.html**

Cookie-Based IDs for RealNetworks Clients

If a RealNetworks client's GUID reporting is not enabled, Helix Universal Server logs an ID based on a client cookie, setting the cookie on the first client access. In subsequent access attempts, the client returns the ID set in the cookie. The cookie-based ID is in the same format as the GUID, and is unique to each Helix Universal Server that delivers content to that client. However, the same client returns a different ID to each Helix Universal Server it contacts.

Although cookies are enabled by default in RealNetworks clients, a user can elect not to accept them. In this case, Helix Universal Server records the ID value it attempted to set, but does not know that the cookie was refused. When the same client does not return a cookie-based ID on its next media request, Helix Universal Server sends another cookie, again recording the ID of a cookie that is rejected. This happens on each media request from that media player, resulting in multiple records that list different IDs because the same media player refused the cookie each time.

> **Note:** In RealOne Player, the user command for controlling cookies is **Tools>Preferences> Connection>Internet Settings**.

Windows Media Player and QuickTime Player IDs

If Windows Media Player and QuickTime Player are configured to send their GUIDs, Helix Universal Server records those ID values. If the players do not send GUIDs, Helix Universal Server generates an ID for the log. In this case, the same media player may be identified by multiple IDs in the log. Windows Media Player and QuickTime Player do not support cookie-based IDs.

Unknown IDs

When Helix Universal Server can't gather an ID because the client does not support GUIDs or cookies (as with a browser requesting Helix Administrator pages), empty square brackets—[ ]—appear in the `[client_ID]` field. If GUID reporting is disabled on the server or media player side, and Helix Universal Server does not attempt to set a cookie-based ID, the `[client_ID]` field shows a series of zeroes instead of a unique client identifier:

```
00000000-0000-0000-0000-000000000000
```

Statistics Results

The `[client_stats_results]` field holds connection statistics sent by the client when it finishes playing a clip, as described in "Client Statistics" on page 346. If the client blocks connection statistics, or the statistics cannot be collected, the field appears as `[UNKNOWN]`.

File Information

The following fields hold information about the requested clip:

- The `file_size` field lists in bytes the amount of media data in the file. This number is less than the total size of the media file because it does not include the file header and other non-media information. For live broadcasts, `file_size` is always `0`.
- The `file_time` field gives the total length, in seconds, of media stored in the media file. For live broadcasts, `file_time` is always `0`. For SMIL files, this is always `20`.
- The `sent_time` field expresses in seconds the total playing time of the media transmitted to the client.

Resend Information

The `resends` field lists the number of packets successfully resent because of transmission errors. The `failed_resends` field gives the number of packets not successfully resent in time to correct transmission errors.

Stream Components

The field [stream_components] is recorded only for RealNetworks media players. It explains the type of material sent, indicated in the following pattern:

```
RealAudio_stream RealVideo_stream Event_stream Image_maps
```

A value of 1 indicates that the clip includes this type of stream. The value 0 indicates that it does not. Thus, a clip that includes RealVideo and RealAudio but no event streams or image maps would appear in the access log as this:

```
1 1 0 0
```

Start Time

The [start_time] field gives the timestamp of when the clip began to stream, according to the Helix Universal Server clock. It is identical in format to the timestamp at the beginning of each access record, but does not list the time difference from Coordinated Universal Time. Here is an example:

```
[26/Jun/2002:10:05:14]
```

Server Address

The server_address field lists the IP address of the Helix Universal Server that delivered the clip.

Average Bit Rate

The average_bitrate field lists the average bit rate of the clip in bits per second.

Packets Sent

The packets_sent field lists the total number of packets sent to the client.

Presentation ID

The presentation_ID field records a number used by all clips in the same SMIL or Ram presentation. SMIL files are also included in the log, and use the same number as their clips. For example, if the log entries for a SMIL file, a video clip, and a GIF image all list presentation ID 437, you can conclude that the SMIL presentation consisted of that video and image. Helix Universal Server assigns the IDs, which are recorded only with logging style 5, when it transmits the clips.

Proxied Clip Information

If clips are proxied, the access log provides additional information about the connection by creating two records for every clip delivered by proxy pull splitting or cache. Proxied clips delivered by passthrough are recorded in the access log with one record. The following table outlines proxy-specific data contained in the access log by the type of Helix Universal Proxy delivery, and the access log field.

Access Log Data for Proxied Clips

Proxy Delivery	Access Log Record	Access Log Field		
		`IP_address`	`bytes_sent`	`[client_info]`
live pull-split	proxy control channel	Helix Universal Proxy IP address	`0`	version and type of proxied client
	proxy live data channel	Helix Universal Proxy IP address	number of bytes sent to proxy	`RealNetworks Broadcast Receiver`
on-demand cache	proxy control channel	Helix Universal Proxy IP address	`0`	version and type of proxied client
	proxy cache data channel	Helix Universal Proxy IP address	number of bytes sent to proxy	version and type of proxy server
passthrough	proxied client connection	Helix Universal Proxy IP address	number of bytes sent to proxy	version and type of proxied client

Note: In the records demonstrating the control channel between Helix Universal Proxy and Helix Universal Server, `bytes_sent` is `0` (zero) because the actual data is sent on a separate data channel.

GET Statements

The `GET` statement within an access log record shows the path and file name of each file that Helix Universal Server served, as well as the protocol and protocol version used to stream or broadcast the file. The following sections show sample entries for `GET` statements used with different types of on-demand and live content.

For More Information: To see the `GET` statement in context, refer to "Logging Style" on page 334.

On-Demand Content

The following table lists the formats in which each type of on-demand content is shown in the GET statements of the access log. For a SMIL presentation, a separate record is generated for the SMIL file and for each file in the presentation. When the logging style is set to 5, you can identify which files are in the same presentation through the numeric identifier at the end of each access record.

GET Statements for On-Demand Content

Feature	Protocol	Example Statement in Access Log
On-demand streamed content	RTSP	"GET presentation/presentation.rm RTSP/1.0"
	PNA	"GET presentation/presentation.rm PNA/10"
	HTTP	"GET presentation/presentation.rm PNH/10"
SMIL files (1 record for the SMIL file, one record for each file listed within the SMIL file)	RTSP	"GET presentation/presentation.smi" "GET presentation/presentation.rt" "GET presentation/presentation.rp" "GET presentation/presentation.rm"
ISP hosting—account-based	RTSP	"GET ~schu/music.rm RTSP/1.0"
	PNA	"GET ~schu/music.rm PNA/10"
	HTTP	"GET ~schu/music.rm PNH/10"
ISP hosting—dedicated	RTSP	"GET s/sc/schu/music.rm RTSP/1.0"
	PNA	"GET s/sc/schu/music.rm PNA/10"
	HTTP	"GET s/sc/schu/music.rm PNH/10"
Helix Administrator activity	HTTP	"GET admin/index.html HTTP/1.0"
View source request (for on-demand and live clips)	HTTP	"GET viewsource/template.html HTTP/1.0"
Authenticated on-demand streamed content	RTSP	"GET secure/topsecret.rm RTSP/1.0"
	PNA	"GET secure/topsecret.rm PNA/10"
	HTTP	"GET secure/topsecret.rm PNA/10"

Live Broadcasts

The following table summarizes the format in which each type of live content is shown in the access log. For live streams from Helix Producer 9 and later, the broadcast mount point is typically broadcast/ or redundant/. For RealProducer G2 through 8.5, it is encoder/. For earlier encoders, it is live/. For

Windows Media broadcasts, the mount point is typically `wmtencoder/`, and for QuickTime it is `qtencoder/`.

While most clips generate one access log record apiece, clips delivered over scalable multicasting generate two records for each client. One is for the `.sdp` file, and the other is for the live broadcast stream. However, if the user saves the `.sdp` file and connects by opening that file, rather than by clicking a link on a Web page, only the live broadcast stream generates a record. For more on scalable multicasting, see "Setting Up Scalable Multicasting" on page 149.

Sample GET Statements for Live Content

Feature	Protocol	Example Statement in Access Log
Unicasted content, from Helix Producer 9 or later	RTSP	`"GET broadcast/live.rm RTSP/1.0"`
	PNA	`"GET broadcast/live.rm PNA/10"`
	HTTP	`"GET broadcast/live.rm PNH/10"`
Unicasted, redundant content	RTSP	`"GET redundant/live.rm RTSP/1.0"`
	PNA	`"GET redundant/live.rm PNA/10"`
	HTTP	`"GET redundant/live.rm PNH/10"`
Unicasted content, from RealProducer G2 through 8.5	RTSP	`"GET encoder/live.rm RTSP/1.0"`
	PNA	`"GET encoder/live.rm PNA/10"`
	HTTP	`"GET encoder/live.rm PNH/10"`
Unicasted content, from pre-G2 encoding source	RTSP	`"GET live/live.rm RTSP/1.0"`
	PNA	`"GET live/live.rm PNA/10"`
	HTTP	`"GET live/live.rm PNH/10"`
SLTA content	any	same as live unicasted content
Authenticated live streamed content	RTSP	`"GET secure/broadcast/live.rm RTSP/1.0"`
	PNA	`"GET secure/broadcast/live.rm RTSP/1.0"`
	HTTP	`"GET secure/broadcast/live.rm RTSP/1.0"`
Push splitting—transmitter's access log	RTSP	No record is created.
	PNA	
Push splitting—receiver's access log	RTSP	`"GET broadcast/Japan/broadcast/live.rm RTSP/1.0"`
	PNA	`"GET broadcast/Japan/broadcast/live.rm PNA/10"`
Pull splitting—transmitter's access log	RTSP	No record is created.
	PNA	

(Table Page 1 of 2)

Sample GET Statements for Live Content (continued)

Feature	Protocol	Example Statement in Access Log
Pull splitting—receiver's access log	RTSP	`"GET broadcast/pull/Japan:2030/encoder/live.rm RTSP/1.0"`
	PNA	`"GET broadcast/pull/Japan:2030/encoder/live.rm PNA/10"`
Multicasting—back-channel	RTSP	`"GET encoder/live.rm RTSPM/1.0"`
	PNA	`"GET encoder/live.rm PNAM/10"`
Multicasting—scalable (two records are usually created)	HTTP and RTP	`"GET concert.rm.sdp HTTP/1.0"` `"GET concert.rm RTP/2.0"`

(Table Page 2 of 2)

For More Information: Chapter 7 explains broadcast mount points.

Client Statistics

All logging styles can include client statistics, which are shown in the preceding sections as `[client_stats_results]`. There are four types of statistics, and the access log can record any combination of them. Each set of statistics is enclosed in square brackets, and begins with a prefix such as `Stat1`. If you log all four types of statistics, for example, the `[client_stats_results]` field looks like this:

[Stat1:*statistics_1*][Stat2:*statistics_2*][Stat3:*statistics_3*][Stat4:*statistics_4*]

Note that although other access log fields are separated by spaces, there is no space between the closing square bracket of one statistics type and the opening square bracket of the next statistics type. The following example shows logging style 5 (see page 336) collecting statistics type 1:

```
207.188.7.125 - - [26/Jun/2002:10:11:03 -0700] "GET real9video.rm RTSP/1.0"
200 858636 [WinNT_5.0_6.0.10.714_RealPlayer_RN92PD_en_686]
[00000000-0000-0000-0000-000000000000] [Stat1: 487 2 1 2 0
44_kbps_Stereo_Music_High_Response_-_RA8] 926322 217 205 1 0 124
```

The following sections describe the information gathered by each of the four statistics types. Statistics 1 and 2 report basic information about playback. Statistics 3 provides information about viewer actions. Statistics 4 reports advanced playback information from RealOne Player. The default logging

setting gathers statistics 1 and 2. The following table lists the media players and versions that can send the various statistics types.

Media Players and Supported Client Statistics Types

Media Player	Statistics 1	Statistics 2	Statistics 3	Statistics 4
RealPlayer 2 and lower	**yes**	no	no	no
RealPlayer 3 and higher	**yes**	**yes**	no	no
RealPlayer 5 and higher	**yes**	**yes**	**yes**	no
RealOne Player and higher	**yes**	**yes**	**yes**	**yes**
Windows Media Player	**limited**	**limited**	**yes**	no
QuickTime Player	no	no	no	no
any other RTP-based player	no	no	no	no

Note the following about client statistics:

- As noted in the following sections, some statistics are not collected for Windows Media Player. In each case, `0` is typically entered for that statistic.
- Helix Universal Server does not record client statistics for QuickTime Player. For each statistics type, `[UNKNOWN]` is logged.
- Users can choose not to send client statistics. On RealOne Player, the command is **Tools>Preferences> Connection>Internet Settings**. If users select this option, `[UNKNOWN]` appears in place of that statistics field.
- The statistics interval, described in "Customizing the Access and Error Logs" on page 353, affects how often statistics are reported.

Statistics Type 1

Statistics type 1 gathers basic information about the success of media clips received by the client. It also tells what codec the client used to decode the audio portion of the clip. For RealNetworks media players, these statistics apply only to a clip's audio stream. The fields are the following:

```
[Stat1: received out_of_order missing early late codec]
```

These fields provide the following information:

`received`	Total number of packets received by the client.
`out_of_order`	Number of packets received by the client out of order. These packets are reordered as the client plays the clip. This information is not recorded for Windows Media Player.

`missing`	Number of packets that the client requested, but that did not arrive.
`early`	Number of requested packets received early by the client. This information is not recorded for Windows Media Player.
`late`	Number of packets received too late by the client. This information is not recorded for Windows Media Player.
`codec`	For Windows Media Player, the names of the audio and video codecs used. For RealNetworks clients, the name of the audio codec used to encode the soundtrack. Possible values for RealNetworks players include: `sipr`—RealAudio version 5 formats `dnet`—RealAudio version 3 formats `28.8`—RealAudio version 2, 28.8 format `lpcJ`—RealAudio version 2, 14.4 format `cook`—RealAudio version 6 format

Statistics Type 2

Statistics type 2 provides details about the success of clip delivery, giving information about bandwidth requests. Resent packets are described in detail. This statistics type identifies which transport type was used to make the connection, and which audio codec played the clip. For RealNetworks media players, these statistics apply only to a clip's audio stream. This set of statistics uses the following format:

```
[Stat2: bandwidth available highest lowest average requested received late
rebuffering transport startup codec]
```

The fields provide the following information:

`bandwidth`	Clip bandwidth in bits per second.
`available`	Average bits per second available to the user while the clip was playing. This information is not recorded for Windows Media Player.
`highest`	Highest time between the client resend packet request and the packet resend arrival, in milliseconds. This information is not recorded for Windows Media Player.
`lowest`	Lowest time between the client resend packet request and the packet resend arrival, in milliseconds. This information is not recorded for Windows Media Player.
`average`	Average time between the client resend packet request and the packet resend arrival, in milliseconds. This information is not recorded for Windows Media Player.
`requested`	Number of resend packets requested by the client.

`received`	Total number of resent packets received by the client.
`late`	Number of resent packets received by the client too late.
`rebuffering`	Rebuffering percentage for the clip.
`transport`	Transport type for the connection. Values are: `0`—UDP `1`—TCP `2`—IP Multicast `3`—PNA over HTTP
`startup`	Time after the media request that the client received the first clip data package, in milliseconds. The data may arrive before the clip starts playing.
`codec`	For Windows Media Player, the names of the audio and video codecs used. For RealNetworks clients, the name of the audio codec used to encoded the soundtrack. Possible values include: `sipr`—RealAudio version 5 formats `dnet`—RealAudio version 3 formats `28.8`—RealAudio version 2, 28.8 format `lpcJ`—RealAudio version 2, 14.4 format `cook`—RealAudio version 6 format

Statistics Type 3

Statistics type 3 provides detailed information about viewer action while playing clips, but not while receiving live broadcasts. It addresses advanced streaming features, notably ads and image maps. For example, you can find out when a viewer clicked on an image map or stopped the clip. Because each user may carry out several actions, the access log file may grow rapidly when you collect these statistics. Be sure to review the log file frequently, or set up log file rolling to keep the logs to a manageable size. This statistics type uses the following format:

```
[Stat3:timestamp|elapsed_time|action|;]
```

Records of activity are separated by a semicolon (;). Thus, the `Stat3` record of a viewer pausing, resuming play, and watching to the clip's end looks like the following:

```
[Stat3:4360|2107|PAUSE|;8401|2107|RESUME|;12608|6321|STOP|;]
```

Timestamp

The initial timestamp field gives the time in milliseconds when the action occurred. It is relative to the connection time of the client. In the preceding

example, the first timestamp is `4360`, meaning the action occurred at 4.360 seconds after the client connected.

Elapsed Time

The `elapsed_time` field records how many milliseconds into the clip timeline that the action occurred. In the preceding example, the `PAUSE` action occurs at `2107`, or 2.107 seconds into the clip timeline. Notice that the `RESUME` action also lists the same elapsed time because this action restarts the clip at the same point where it paused.

Action

The action field records one of several different actions such as `STOP` or `PAUSE`, as described below.

CLICK

Viewer clicked on the image map. Further information includes:

`x-coord`	Horizontal coordinate of the click.
`y-coord`	Vertical coordinate of the click.
`action`	Action that occurred. This is one of the following: `PLAYER="`*`url`*`"`—The URL of a media link the viewer clicked. `URL="`*`url`*`"`—The URL of a browser link the viewer clicked. `SEEK="`*`destination`*`"`—The seek destination point, in milliseconds.

PAUSE

The viewer paused the client.

RESUME

Resume play after a pause, seek, or stop.

SEEK

The seek destination point, in milliseconds.

STOP

End of clip reached.

RECSTART

Media player began recording the clip.

RECEND

Media player stopped recording the clip.

Statistics Type 4

Sent only from RealOne Player, statistics type 4 gathers most of the same information included in statistics type 1 and type 2, adding packet and bandwidth information for each stream, including the visual tracks of video clips. Statistics type 4 uses the following format:

```
[Stat4:stream_number|mime_type|codec|received|lost|resent|average_bandwidth
|current_bandwidth|;...information for next stream...|transport turobplay duration
clip_end]
```

The following is an example type 4 log entry for a RealVideo Clip:

```
[Stat4:2 audio/x-pn-realaudio|44_kbps_Stereo_Music_High_Response_-_RA8
|44100|940|0|0|;video/x-pn-realvideo|N/A|180889|2918|0|0| 1 0|1|0| 90 2]
```

> **Note:** If you turn on statistics type 4 as well as statistics type 1 or 2, RealOne Player reports only statistics type 4. Other media players, however, will report statistics type 1 or 2, but not statistics type 4.

Stream Number

The `stream_number` field indicates how many media streams the clip contains. A video clip might have two streams, for example, one for the audio track and one for the visual track. Following this, information for each stream is reported.

Stream Information

Helix Universal Server reports information for each stream. Information ends with a semicolon. For each stream, the following fields are reported:

`mime_type`	MIME type, such as `audio/x-pn-realaudio`.
`codec`	Codec used for the stream, such as `44_kbps_Stereo_Music_High_Response_-_RA8`.
`received`	Number of packets received.
`lost`	Number of packets lost.
`resent`	Number of packets resent.
`average_bandwidth`	Average bandwidth over the course of clip playback in bits per second.
`current_bandwidth`	The bandwidth in bits per second used when the statistics are reported.

Transport

The `transport` field indicates the transport protocol used for the connection. Values are:

0	IP Multicast
1	UDP
2	TCP
3	HTTP cloaked

TurboPlay

Three `turboplay` fields indicate the use and results of the RealOne Player TurboPlay feature. The three fields are separated by pipes, as shown here:

```
1|513234|1120
```

The following table lists the possible field values. Values for the second and third field vary depending on whether TurboPlay is on or off, as indicated in the first field.

TurboPlay Field Values

Field 1	Field 2	Field 3
0 (off)	Reason TurboPlay is off: 1—User preference. 2—Available bandwidth below 256 Kbps. 3—SureStream in use. 4—Excessive rebuffering. 5—Presentation not enabled for TurboPlay. 6—Server not enabled for TurboPlay. 7—Live presentation not supported.	0 (not used)
1 (on)	Accelerated delivery rate in bits per second requested by TurboPlay.	Average buffering time in milliseconds for start of playback, seeking, and so on.

Duration

The `duration` field gives the time in milliseconds between the initial client request and the first data packet received by the client.

Clip End

The `clip_end` field lists the reason the presentation ended. Possible values are:

`0`	end of presentation reached
`1`	stop command issued
`2`	reconnection required
`3`	redirection
`PNR_`*n*	error code *n* occurred

Customizing the Access and Error Logs

The following sections explain how to modify the logging of access and error records. Logging is turned on by default. You may want to change certain default options, however.

Modifying the Access Log

The access log is preconfigured to gather basic client statistics for media player requests. You may want to change the logging style and client statistics types, as well as set up log file rolling.

➤ To modify access logging:

1. Click **Logging & Monitoring>Access & Error Logging**. Access logging fields are at the top of the page.
2. For **Logging Style**, choose a number from 0 to 5. The default is `5`. For information about the logging style, see "Logging Style" on page 334.
3. If you do not wish to collect client identifiers, choose `Yes` from the **Disable Client GUIDs** pull-down list. This eliminates the collection of client global identifiers, as well as cookie-based IDs. For more information, see "Client Identifier" on page 339.
4. The **Domain Cookie ID** pull-down list is set to `Enabled` by default. This means that Helix Universal Server attempts to set a cookie on each client. This cookie provides a client ID logged in place of a suppressed GUID when the client requests content. To disable cookie setting, select `Disabled`. For more information, see "Client Identifier" on page 339.

   Tip: Cookie-based IDs are also disabled on Helix Universal Server if you choose `Yes` for **Disable Client Guids**.

5. The **Client Stats Interval** setting determines the frequency in seconds that the client reports statistics. A value of `30`, for example, means that the client sends statistics, and Helix Universal Server creates new log entry, every 30 seconds. If you set this to `0` (zero), the client sends statistics once when the presentation ends.
6. In the **Client Stats** check boxes, select the types of client statistics that each media player reports. You can choose any combination of statistics, or deselect all boxes to gather no client statistics. The default settings are `Type 1 and Type 2`. For more information, see "Client Statistics" on page 346.

   > **Tip:** If you gather statistics type 3 or 4, the access log file size will grow rapidly. In this case, be sure to review the log file frequently, or use log file rolling.

7. You can choose to create a new log file at certain intervals, as described in "Log File Rolling" on page 331.
   a. To create a new log file at regular intervals, set the period through the **Log Rolling Frequency** pull-down lists. You can roll the log hourly, daily, weekly, or monthly.
   b. To limit the log file by size, type the maximum number of Megabytes in the **Log Rolling Size** box.

   > **Tip:** Generally, you limit log files by frequency or size. You can select both methods, however, to create log files according to the first limit reached. For example, you can create a new log file whenever the preceding file reaches 10 Megabytes in size, or has recorded 3 days of activity, whichever comes first.

8. The **Access Log File** field specifies the log file name and absolute path. The default path is the `Logs` subdirectory of the Helix Universal Server main directory. The default file name of the access log file is `rmaccess.log`.

   > **Note:** If **Access Log File** is blank, Helix Universal Server records access information in a file named, `rmaccess.log`, located in the same directory as the Helix Universal Server executable file.

9. Click **Apply**.

Modifying the Error Log

Using the error log requires no configuration. You may want to set up log file rolling, though, or specify a different location and name for the error log. For basic information on error log syntax, see “Error Log” on page 330.

➤ To modify the error log:

1. Click **Logging & Monitoring>Access & Error Logging**. Error logging fields are at the bottom of the page.
2. You can choose to generate a new error log file at certain intervals, as described in “Log File Rolling” on page 331.
   a. To create a new log file at regular intervals, set the period through the **Log Rolling Frequency** pull-down lists. You can roll the log hourly, daily, weekly, or monthly.
   b. To limit the log file by size, type the maximum number of Megabytes in the **Log Rolling Size** box.

      Tip: Generally, you limit log files by frequency or size. You can select both methods, however, to create log files according to the first limit reached. For example, you can create a new log file whenever the preceding file reaches 10 Megabytes in size, or has recorded 3 days of activity, whichever comes first.
3. The **Error Log File** field specifies the log file name and absolute path. The default path is the `Logs` subdirectory of the Helix Universal Server main directory. The default name of the error log file is `rmerror.log`.
4. On Windows NT systems, you can send error messages to the Windows Event Viewer. For **NT Event Log Filter**, select the NT error level you want to assign to Helix Universal Server error messages.
5. Click **Apply**.

CHAPTER

17

CUSTOM LOGGING

Helix Universal Server's custom logging feature allows you to monitor specific types of events and information that occur on Helix Universal Server. You can thereby create reports about any type of activity you choose. This chapter explains how to use the custom logging feature, which supplements the main log files described in Chapter 16.

Understanding Custom Logging

Custom logging is a highly flexible feature that allows you to gather the exact information you want, reporting it at any time to different outputs such as the screen or a text file. You can use this feature to gather information about current Helix Universal Server client connections, for example. Custom logging is designed to supplement the access and error logging described in Chapter 16, but you may find that custom logging is adequate for all of your logging requirements.

The Helix Universal Server Registry

To get information for reports, custom logging relies on information stored in the Helix Universal Server registry, which is distinct from the main registry on Windows operating systems. The registry contains information about most aspects of Helix Universal Server. Although the registry is an extension of Helix Administrator, there is no link to it from any Helix Administrator page. However, you can display the registry by opening the following URL in a browser:

`http://`*`address:AdminPort`*`/admin/regview.html`

Registry Variables

The Helix Universal Server registry stores information in variables such as `LiveConnections.Count`. Each variable reports a specific type of value or setting,

from real-time data on client connections and server health, to configuration and license information. When you create a custom logging template, you add variables to your report by selecting them from a pop-up HTML list. Within a report template, variables are always preceded and followed by percent signs, as in `%LiveConnections.Count%`.

Global Variables

Through the variables list, you can also choose global variables, such as the time of day, that are derived from the operating system rather than extracted from the Helix Universal Server registry. The following table lists the global variables that you can include in reports.

Global Variables

Variable	Description
`%Date%`	Indicates the current date in the format `MM/DD/YY`.
`%Time%`	Provides the current time of day in the local time zone in the format `HH:MM:SS`.
`%GMTime%`	Displays the current Greenwich Mean Time in the format `HH:MM:SS`.
`%TZDiff%`	Indicates the difference between local time and Greenwich Mean Time. For example, the output for Pacific Standard Time is `-0800`.
`%Hour%`	Displays the current hour by local time zone in the format `HH`.
`%Min%`	Indicates current minute in the format `MM`.
`%Sec%`	Adds the current second in the format `SS`.
`%%`	Creates a percent sign (%).

Template Types

You add the registry variables that you want to track to a report template, which defines how often the selected information is reported, as well as where the report is delivered, such as to a file or to the console. You can use three types of templates:

- Interval

  Interval templates log information at regular intervals, such as every hour. You can define exactly how much time elapses between report output. Interval reports are useful for producing regular status reports about Helix Universal Server health, for example.

- Watch

  With a watch template, you can set a watch on a certain variable, or group of variables, generating a report when information changes. A watch template is useful for reporting errors, for example, because a report is generated only when an error occurs.

- Session

  As system activity occurs, Helix Universal Server dynamically adds and deletes variables from its registry. When a media player requests a clip, for example, Helix Universal Server creates a unique registry entry for that player, storing information such as the player address and the requested URL. A session template reports on this dynamic activity as it happens.

  For More Information: See "Using Session Templates" on page 359 for more information about these templates.

Report Formats

Through the report template, you format a report, adding boilerplate text around selected variables if you wish. For example, you might create an entry like the following:

```
With a total of %LiveConnections.Count% player connections, Helix Universal
Server
is using %Server.Bandwidth.Output% bits per second of bandwidth.
```

In this example, `%LiveConnections.Count%` and `%Server.Bandwidth.Output%` are variables, and the rest of the text is boilerplate. When Helix Universal Server generates the report, it replaces the variable entries with values from its registry. The resulting report looks like this:

```
With a total of 50 player connections, Helix Universal Server
is using 2,800,000 bits per second of bandwidth.
```

Using Session Templates

A session template reports on dynamically added and deleted registry variables. Helix Universal Server creates registry variables when media players, encoders, transmitters, and other components connect to it. These variables store information about the component. Using a session template, you can create a report when one of these components connects, disconnects, or both.

This lets you record statistics about each media player, for example, such as the player's IP address, its request URL, its bandwidth, and so on.

Choosing a Watch Type

When you create a session template, you select a watch type, which specifies the type of component connection that generates the report. The following table describes the possible values that you can choose.

Watch Types

Watch Type Value	Registry Values Watched
`Client Session [Client.Session]`	Client connections.
`Client Stream [Client.Session.Stream.*]`	Individual media player streams.
`Broadcast Receiver [BroadcastReceiver.Statistics]`	Splitting receivers.
`Broadcast Transmitter [BroadcastDistribution.Statistics]`	Splitting transmitters.
`Broadcast [LiveConnections]`	Live connections.
`Broadcast Archiver [LiveArchiving.Archiver]`	Live broadcast archiving.
`Distributed Licensing[DistributedLicensing. Publishers.Subscribers]`	Distributed licensing.

For example, if you choose `Client Session [Client.Session]` as the watch type, you can generate a report every time a client connects or disconnects. In this case, clients can be media players requesting clips, as well as browsers displaying Helix Administrator HTML pages. In your report, you then choose which registry variables from that client connection you want to log.

> **Tip:** The section "Creating a Client Statistics Log" on page 367 provides an example of how to gather client statistics.

Selecting the Output Format Type

For each session template, you can choose whether to generate the report when the watched component connects, when it disconnects, or both. When you set up the template, you choose an output format from a pull-down list:

`Session Added Output Format`	Generate a report with the specified variables when the watched component connects.
`Session Deleted Output Format`	Generate a report with the specified variables when the component disconnects.

The two output formats allow you to report on different variables when a component session begins, then when it ends. When a client connects, for example, you may want to record several variables, including the client's IP address, request URL, streaming protocol, transport protocol, and so on. When it disconnects, though, you might want to record just the time and IP address.

Defining Output Methods

The custom logging output methods determine how Helix Universal Server publishes the report. There are several options, and you can select multiple delivery methods for each custom log report. Additionally, multiple report templates can write to the same output, such as the same file. Most outputs require configuration. For example, if you send your report to a file and a local TCP port, you specify a file name and a port number.

Console

The `Std Error` (Standard Error) and `Std Out` (Standard Output) options both publish the report to the command line console. No configuration is required.

File

When you select the `File` output method, Helix Universal Server publishes the report to a text file, continuously appending new results to the end of the file unless you set up log rolling. You configure the following variables:

`File name`	The log file name. The default location is the main Helix Universal Server installation directory. You can specify a relative or absolute path using the syntax appropriate for your operating system.
`Log Rolling Frequency`	How many hours, days, weeks, or months pass before a new log file is created (optional).
`Log Rolling Size`	Maximum size in Megabytes that the log file can become before a new file is created (optional).

Using Log File Rolling

Log rolling is optional, but recommended if you expect to report statistics frequently. If multiple templates write to the same file log file, define log rolling in just one template.

Log Rolling Methods

Generally, you limit log files by frequency or size. You can select both methods, however, to create log files according to the first limit reached. For example, you can create a new log file whenever the preceding file reaches 10 Megabytes in size, or has recorded 3 days of activity, whichever comes first.

Timestamps

When you implement log rolling, Helix Universal Server appends a timestamp to the end of the file name to indicate when the file was created. Suppose that you specify the file name `serverstats.txt`. Your log directory may contain several files with the same base file name, but each with a unique timestamp that looks like this:

```
serverstats.txt.20020622134953
```

The timestamp is in the format `YYYYMMDDHHMMSS`, using a 24-hour clock. Hence, the file in the preceding example was created on June 22, 2002, at 1:49.53 P.M.

HTTP Post

With the `HTTP Post` method, Helix Universal Server publishes the report to a Common Gateway Interface (CGI) program. You configure the following variables:

`URL`	URL location of the CGI program.
`Port`	Number of the HTTP port on the Web server receiving the log.

TCP Broadcast

The `Outbound TCP` and `Inbound TCP` output destinations let you send the report to an application listening on a specific TCP port. The `Outbound TCP` method publishes the log on a remote computer. For this method, you configure the following variables:

`Destination`	Host name or IP address of the computer that receives the log.
`Port`	Number of an open port on the specified computer.

The `Inbound TCP` method publishes the log on the local computer. You configure the following variable:

`Port`	Number of an open port on the local computer.

UDP Broadcast

The `Outbound UDP` and `Multicast UDP` methods publish the report to a UDP socket on a remote computer using unicast or multicast UDP, respectively. You configure the following variables:

`Destination`	Host name or IP address of the computer where the report should be published. For `Multicast UDP`, enter a Class D IP multicast address.
`Port`	Number of an open port on the specified computer.

UNIX Pipe and System Log

On UNIX operating systems, the `Pipe` and `Syslog` methods make the log available to another process, or publish the information to the system log, respectively. For `Pipe`, you configure the following variable:

`Command`	Pipe command to the application or script where the information can be post-processed.

For `Syslog`, you choose one the following priorities, each of which corresponds to an entry type in the UNIX system log:

- `LOG_EMERG`
- `LOG_ALERT`
- `LOG_CRIT`
- `LOG_ERR`
- `LOG_WARNING`
- `LOG_NOTICE`
- `LOG_INFO`
- `LOG_DEBUG`

Windows NT Event Log

If you choose `NT Event Log`, Helix Universal Server publishes the report to the event log that corresponds to the priority selected. Each option corresponds to an entry type in the Windows NT Event Log:

- `LOG_ERR`
- `LOG_WARNING`

- `LOG_INFO`

Creating Logging Templates

The following procedure explains how to create a new custom logging template, or modify an existing one. You'll need to be familiar with the information in the preceding sections to set up your custom template. Preconfigured templates are ready to use, but must be turned on. These templates are described in the section "Using the Preconfigured Templates" on page 366.

➤ **To create or modify a custom logging template:**

1. Click **Logging & Monitoring>Custom Logging**.
2. To create a new template, click the "+" icon in the **Templates** area, and edit the name in the **Template Name** box. This name is for your reference only. To select an existing template, highlight its name in the **Templates** area.
3. In the **Template Type** list box, select `Watch`, `Session`, or `Interval` to set the overall type of template. The option you choose affects other options that appear on the page, as described in Step 7 through Step 9.

   For More Information: See "Template Types" on page 358.

4. From the **Template Status** box, select `On` or `Off` to enable or disable the custom logging report, respectively. An existing template starts or stops reporting as soon as you change its status and click **Apply**.
5. Optionally, you can enter a description in the **Template Description** box. This is for your own reference only, but is highly recommended.
6. You next select one or more output types for the report to determine where Helix Universal Server sends the report information:
   a. Select an output type from **Add Output Type** pull-down list.
   b. Optionally, edit the name in the **Output Name** box. This name is for your reference only.
   c. For the selected output type, enter the necessary configuration parameters, as described in "Defining Output Methods" on page 361.
7. If you chose a `Watch` template in Step 3, follow this step. Otherwise, skip to the next step. Click `Property List` in the **Watches** area. In the list that

appears, choose the variable or variables that you want to watch for changes.

> **Note:** Place each watched variable on a separate line in the **Watches** list. Helix Universal Server determines which variables to watch by matching the string that appears on each line of the **Watches** list.

The optional minimum and maximum output intervals for the `Watch` template let you generate the report at regular intervals. If you do not define either field, Helix Universal Server creates the report only when a watched registry variable changes:

- **Minimum Output Interval**
  This field holds a number in the format `HH:MM:SS` that defines the smallest possible time that must pass between log outputs. Changes to the watched variables are not reported until the minimum interval has elapsed. If you set `00:05:00`, for example, watched variables that change are reported every five minutes. If no watched variable changes its value in five minutes, though, the report is not created until a variable changes, or the maximum interval is reached.
- **Maximum Output Interval**
  This entry contains a number in the format `HH:MM:SS` that defines the longest possible time allowed to pass before the report output is generated. Changes to variables being watched will generate the report output even if the maximum interval has not been reached, however. If you set `01:00:00`, for instance, and no watched variable changes within an hour after the last report, Helix Universal Server generates the report when the hour elapses.

8. If you chose `Session` in Step 3, select the appropriate watch type from the **Watch Type** list box. Otherwise, skip to the next step. As described in “Choosing a Watch Type” on page 360, the watch type you select determines which dynamic event triggers the report output.
9. If you chose `Interval` in Step 3, set the appropriate combination of hour, minute, and seconds for the report interval in the **Output Interval** boxes. If you leave a box blank, the setting for that box is considered to be 0.
10. In the **Output Format** area, click **Property List** to pick the variables from the Helix Universal Server registry included in the template. If you’re setting up a `Session` Template, you can specify up to two output formats,

one for **Session Added Output Format**, and one for **Session Deleted Output Format**.

a. In the property list window, navigate to the variable that you want to include in the template.

b. When you click on a variable, a string identifying that variable appears in the **Output Format** text box. Helix Universal Server reports values for variables in the exact order the variables appear in the text box. To organize the order of variables, cut and paste them in the order that you want them to appear in your report.

Tip: A variable added to the **Output Format** text box is surrounded by percentage signs (`%Server.Bandwidth.Output%`). If you reorganize the order of the variables, make sure to include the percentage signs that surround each variable name.

c. Optionally, format the report output by adding boilerplate text.Two tags help with formatting the output sting. Use a `\n` tag to move output to a new line. Carriage returns you enter in the box are also recognized as new lines. Use a `\t` tag to insert a tab.

11. Click **Apply**.

Sample Templates

This section explains how to use the preconfigured templates that come with Helix Universal Server. It then provides an example of setting up your own template to log client statistics.

Using the Preconfigured Templates

Helix Universal Server comes preconfigured with three templates that illustrate the interval, watch, and session template types. Each template reports output to the console, but is turned off initially. To use a template, you must enable it and, optionally, customize it by changing the output destination or modifying the reporting variables. You can also ignore these templates and create your own. The following sections explain these templates.

Errors Template

The preconfigured `Errors` template is a watch-type template. Whenever Helix Universal Server encounters an error, the `Errors` template writes the message to the console. You may want to modify this template to send the output to a file, for example. As well, you can establish minimum and maximum intervals instead of reporting each time an error occurs.

Extended Logging Template

The preconfigured `Extended Logging` template is an example of a session template. It gathers information about client sessions, including media players and Helix Administrator activity, and publishes the report to the console when a client session ends. A single line of the report output looks like this:

```
09:55:28 127.0.0.1 RTSP GET real9video.rm RealMedia Player Version 6.0.9.1349
(win32)
```

Server Stats Template

The preconfigured `Sever Stats` template is an example of an interval template. It is designed to send basic server statistics to the output console every hour. Optionally, you can modify the variables it reports, write the information to a file, or change its boilerplate text. The report output looks like this:

```
Server Stats (06/17/02 10:33:52)
   Uptime: 1234274 seconds
   CPU Percent Usage: 5
   Players Connected: 32
   Players Connected in the Last 10 Seconds: 2
   Players Connected by Protocol: 0 PNA, 22 RTSP, 10 MMS, 0 HTTP (0 Cloaked)
   Players Connected by Transport: 0 TCP, 32 UDP, 0 MCast
   Total Subscribed Bandwidth Output: 9385984 bps
   Total Actual Bandwidth Output: 9244432 bps
   Average Bandwidth Output Per Player: 293312 bps
   Memory Stats: 14294824 Bytes In Use
```

Creating a Client Statistics Log

This example illustrates how to log information about each client request, including media players requesting clips and browsers requesting Helix Administrator pages. This sample template also logs information when each

client disconnects. In your template, you would set up the following basic parameters:

Template Name:	*any*
Template Type:	Session
Template Status:	on
Template Outputs:	*any*
Watch Type:	Client Session [Client.Session]

Connection Statistics Boilerplate and Variables

For **Session Added Output Format**, you define the report information you want to collect when a client connects. You create a report using boilerplate text and variables chosen from the pop-up property list. Note that \n adds a new line to the report. You can also use \t to insert tabs. Here's an example:

```
\n\n****CLIENT REQUEST****
Date and Time: %Date%, %Hour%:%Min%.%Sec%
**CLIENT INFORMATION**
Type: %Client.*.User-Agent%
Address: %Client.*.Addr%
Total Bandwidth: %Client.*.Bandwidth%
Preferred Language: %Client.*.Language%
**CLIP INFORMATION**
Requested URL: %Client.*.Session.*.PlayerRequestedURL%
Clip Size in Bytes: %Client.*.Session.*.FileSize%
Title: %Client.*.Session.*.FileHeader.Title%
Author: %Client.*.Session.*.FileHeader.Author%
Copyright: %Client.*.Session.*.FileHeader.Copyright%
Stream Count: %Client.*.Session.*.FileHeader.StreamCount%
**TRANSPORT INFORMATION**
Protocol: %Client.*.Protocol%
Port: %Client.*.Port%
UDP used (0=no, 1=yes): %Client.*.IsUDP%
```

Disconnect Statistics Boilerplate and Variables

For **Session Deleted Output Format**, you define the report information you want to collect when a client disconnects. Here's an example:

```
\n\n****CLIENT DISCONNECT****
Date and Time: %Date%, %Hour%:%Min%.%Sec%
Type: %Client.*.User-Agent%
Address: %Client.*.Addr%
Requested URL: %Client.*.Session.*.PlayerRequestedURL%
```

Report Output

Once you've defined your template and applied the changes, Helix Universal Server sends the custom logging information to the chosen output each time a client connects or disconnects. The following is an example of a single media player connecting, then disconnecting.

```
****CLIENT REQUEST****
Date and Time: 06/19/02, 14:53.51
**CLIENT INFORMATION**
Type: RealMedia Player Version 6.0.9.1349 (win32)
Address: 207.188.7.125
Total Bandwidth: 57600
Preferred Language: es, *
**CLIP INFORMATION**
Requested URL: rtsp://208.147.89.157:554/video1.rm
Clip Size in Bytes: 2479645
Title: Introductory Video
Author: RealNetworks, Inc.
Copyright: ©2002 RealNetworks, Inc.
Stream Count: 1
**TRANSPORT INFORMATION**
Protocol: RTSP
Port: 7180
UDP used (0=no, 1=yes): 1

****CLIENT DISCONNECT****
Date and Time: 06/19/02, 14:59.15
Type: RealMedia Player Version 6.0.9.1349 (win32)
Address: 207.188.7.125
Requested URL: rtsp://208.147.89.157:554/video1.rm
```

CHAPTER

18

ACTIVITY MONITORS

To manage activity on your Helix Universal Server, you'll want to know which clips are popular, what the stream load is, and whether viewers are being turned away. Helix Universal Server includes a Java-based Server Monitor and, for Windows NT users, an NT Performance Monitor that help make system management easier.

> **For More Information:** To generate reports of historical activity, see Chapter 16, "Access and Error Logs" or Chapter 17, "Custom Logging".

Using the Server Monitor

The Server Monitor is a configurable graph that displays real-time information about the number of connected clients, the resources used, and the clips being streamed. It shows who is using Helix Universal Server, when it is most used, and which files are the most requested. Start Server Monitor by clicking **Logging & Monitoring>Server Monitor**

Server Monitor uses a Helix Universal Server port that you can change, as described in "Defining Communications Ports" on page 59. It uses the password you selected for Helix Administrator during installation. It does not prompt for the password, though, if you are already logged into Helix Administrator.

> **Note:** The Server Monitor password is stored in the `MonitorPassword` variable of the configuration file, and can be changed by modifying the configuration file. For more information about the configuration file, see Appendix A.

> **Tip:** You can also create other external Server Monitors to track more than one Helix Universal Server. A monitoring message

displays along the bottom of each window, telling you which Helix Universal Server is being monitored.

Selecting Server Monitor Modes

The Server Monitor can run as an applet or application. Running it as an applet though Helix Administrator is the most common approach. But you may also want to run it as a Java application.

Running Server Monitor as an Applet

When you select **New Window** from the **Options** menu, the new Server Monitor runs as an applet. This mode has the following features and limitations:

- Can be run from inside a Web browser.
- Can be run from any remote machine with a Java-enabled browser.
- Settings may not be saved when you switch among the Helix Administrator's Web pages.
- Developers can use a scripting language and the parameters below to customize the Server Monitor applet to their specifications.

Applet Parameters

Parameter	Possible Values	Default Value
dragZoom	enabled, disabled	enabled
viewPanel	keyPanel, resourcePanel, clientPanel, filePanel, minimized, disabled	keyPanel
StatusBar	enabled, disabled	enabled
PlayerCount	enabled, disabled	enabled
FileCount	enabled, disabled	enabled
EncoderCount	enabled, disabled	enabled
MonitorCount	enabled, disabled	enabled
SplitterCount	enabled, disabled	disabled

Running Server Monitor as an Application

You can also run Server Monitor as an application, which offers the following features and requirements:

- No Web browser needed.

- Can switch among different servers without spawning new windows.
- Java class files, available for free download from Sun, must be installed on the local machine. They are described below.

➤ To run Server Monitor in application mode:

1. Download and install version 1.1 of the Java Development Kit, available as a free download from Sun's Web site at **http://java.sun.com/j2se/**. Follow the installation instructions on the Web site to install the Java Development Kit on your system.
2. In a command prompt, navigate to the directory where the newly installed Java class files are located. Change to the `Bin` subdirectory.
3. At a system prompt, type the following:
   ```
   jre -cp Monitor.jar Monitor
   ```
4. In the logon screen, enter the following items:
   - **Helix Universal Server name**—use the IP address or host name of the machine on which Helix Universal Server is installed.
   - **Monitor Port**—you can find this number by clicking **Server Setup> Ports** in Helix Administrator.
   - **Monitor Password**
5. Click **OK**.
6. Server Monitor starts.

Server Monitor Used with Other Features

Server Monitor displays all on-demand and live presentations that are currently being streamed or broadcast. It does not differentiate among the delivery methods—whether streaming, unicasting, splitting, or multicasting.

Server Monitor used with Other Features

Other Feature	Notes
Live Archiving	Server Monitor does not indicate whether live files are being archived.
SLTA	Server Monitor does not distinguish the source of a clip; thus it never shows whether a broadcast is coming from an event in progress or SLTA.

(Table Page 1 of 2)

Server Monitor used with Other Features (continued)

Other Feature	Notes
Splitting	On the transmitter, no connections are displayed in Server Monitor. On the receiver, the split connection will appear under the Connections tab as an encoder.
Multicasting	Server Monitor can show clients that are receiving back-channel multicasts, just as it shows clients receiving any other type of broadcast or stream. However, it will not show the number of clients receiving scalable multicasts.

(Table Page 2 of 2)

Displaying Server Monitor Information

There are several ways you can control what Server Monitor displays. This section describes the commands present on the Server Monitor display area and their functions.

Choosing Display Options

Select the pull-down **Options** menu in the upper-left corner of Server Monitor to configure the Monitor's features, or spawn an external Server Monitor that runs outside of the browser

Options Menu Commands

Command	Action
New Window	Create a new, external monitor. You can then minimize the browser and resize the new monitor.
Pause	Freeze the graph. Server Monitor continues to receive data, but the graphical display of data does not change. Click **Resume** from **Options** to resume the graphing.
Reset	Clear the graph and reset all peak data.
Configure	Display the configuration screen. Here, you can specify the update frequency in seconds and the time scale for server activity in minutes. You can also select which statistics to monitor.
Autofit	Rescale the graph so that it fits within the viewable area. Note that whenever you zoom, the autofit feature is disabled. Select **AutoFit** again to re-enable the feature.

(Table Page 1 of 2)

Options Menu Commands (continued)

Command	Action
Zoom In	Zoom in on the graph. Use the mouse to select a range over the graph to zoom in for a closer view. Hold down the **CTRL** key on your keyboard, and click the mouse to Autofit the graph.
Zoom Out	Zoom out from the graph.

(Table Page 2 of 2)

Monitoring Activity

The **Key**, **Performance**, **Connections**, and **Files** tabs each have a specific focus, providing you with an overall picture of server performance. Clicking the active tab expands or collapse the tab information and show only the tab name, leaving more room for the monitor.

Key Tab

Through the **Key** tab, you can control how Helix Universal Server information is graphed. By clicking different options in the **Line** column, you can control what colors and line widths are used to display Helix Universal Server information

Key Tab Columns

Column	Purpose
Line	Controls the order, width, and color of monitoring lines in the graph. Click the left-most up arrow to move a row up. Click the line graphic to change the line width, and click the arrows at the right to choose one of 16 possible colors for the line.
Name	Indicates the item being monitored: Players, Monitors, Encoders, Files, and Receivers.
Current	Shows the number of the current connections.
Peak	Shows the peak number of files monitored, along with the time and date.

Performance Tab

The **Performance** tab provides statistics on Helix Universal Server performance

Performance Tab Columns

Column	Purpose
CPU Usage	Shows current CPU usage.
Memory Usage	Indicates Helix Universal Server memory usage in Kilobytes.
Bandwidth	Displays the amount of data being sent in Kilobits per second.
Players Connected	Lists the numbers of clients connected.
File Usage	Lists the number of files being served.

Connections Tab

This tab provides background on connected clients and the files they are accessing.

Connections Tab Columns

Column	Purpose
IP Address	Gives the client software's host Internet Protocol (IP) address.
Type	Indicates the type of browser or client software.
Duration	Shows the amount of time the client has been connected.
Filename	Provides the name of the file being served.

Files Tab

The files tab provides statistics on all files being served.

File Tab Column

Column	Purpose
Filename	Provides the name of the file being served.
Current	Indicates the number of clients currently connected.
Total	Shows how many times the file was served during this monitoring session.
Peak	Shows the peak number of files monitored, along with time and date.

Windows Performance Monitor

Helix Universal Server is designed to work with the Windows Performance Monitor to show activity on one or more Helix Universal Servers. This option is available if you are running Helix Universal Server on Windows NT/2000/XP, and are viewing it from that same computer. Performance Monitor files containing the Helix Universal Server statistics, `rmserver.pmc` and `rmserver.msc`, are supplied.

You can also configure the Performance Monitor to show Helix Universal Server status from any computer on your network. The Performance Monitor can show the types of information listed in the following table.

Windows Performance Monitor Information

Information	Indicates
Clients and protocol	The number of active clients. Also shown are the protocols used by the clients to receive streams.
Connection type	The number and type of connections, whether TCP or UDP.
Multicast connections	The number of active multicast connections.
Total bandwidth	The number of bits per second being consumed.
Percent of processor	How much processor time Helix Universal Server is using.
Connections	How many encoders, monitors, and receivers are connected.
Incoming bandwidth	Bandwidth of streams arriving from encoders.
Files playing	Number of files playing, including all the files in a SMIL presentation. Live files are also shown.
Files archiving	Number of live files being saved.

Using the Performance Monitor, you can display any combination of this information in any of the following formats:

- A chart that graphs activity over time.
- Alerts that notify the administrator through e-mail, or run programs based on criteria.
- Log files that list activity on Helix Universal Server.
- Reports based on activity information.

For More Information: For information on configuring these formats, see the online help in the Performance Monitor.

PART

VIII

APPENDIXES

The following appendixes contain useful reference information.

APPENDIX

A

CONFIGURATION FILE

When you start Helix Universal Server, it reads a configuration file to gather system settings. When you change Helix Universal Server configuration information, Helix Administrator updates the configuration file automatically. This appendix provides general information about the configuration file.

> **For More Information:** For details about configuration lists and variables, see the *Helix Universal Server Configuration File Reference* at **http://www.realnetworks.com/resources/contentdelivery/server/config_variables.html**.

Understanding the Configuration File

The configuration file holds the Helix Universal Server information in a series of XML-formatted lists and variables. The default file is `rmserver.cfg`, but you can specify an alternate file at startup, as described in "Starting Helix Universal Server" on page 41. The alternate file might be one that you have manually edited, using `rmserver.cfg` as a starting point.

The Helix Universal Server installation directory contains a backup copy of the configuration file named `default.cfg`. This is a mirror image of the default `rmserver.cfg` file that was created during installation. You can restore your configuration file from the backup if you make changes that you want to undo, or if you accidentally delete the main copy.

> **Note:** Be sure to store the configuration file where only authorized users can make changes to it. The default location is Helix Universal Server's `Bin` directory.

> **Tip:** If you have multiple servers, you may want to name each configuration file differently to identify which server you're working with.

Editing the Configuration File

You can change Helix Universal Server settings by editing the configuration file with any text editor or XML editor. Some third-party plug-ins may require that you add parameters and variables manually to the configuration file, for example. The configuration file's tags are based on XML (eXtensible Markup Language), and the file is organized into sections for clarity. There are four types of tags in the file:

1. XML declaration tag
2. optional comment tags
3. list tags
4. variable tags

Of these four types, only lists and variables make up the instructions to Helix Universal Server. All values for lists and variables are enclosed in double quotation marks.

> **Tip:** When you edit the configuration file manually, be sure to use correct syntax. Helix Universal Server looks for exact spellings and correct use of angle brackets. Helix Universal Server does not display messages related to syntax errors. Instead, it ignores any settings that it does not recognize.

> **Note:** Because Helix Administrator reflects the settings of the configuration file in use, exit Helix Administrator before opening the configuration file with a text editor.

XML Declaration Tag

The XML declaration tag indicates which version of XML is in use. Helix Universal Server version 9.0 uses XML version 1.0. The declaration tag looks like this:

```
<?XML Version="1.0" ?>
```

Comment Tags

Optional comment tags are used in the configuration file to identify tag functions. Identical to comment tags in HTML, they begin with <!-- and end with -->. For example, the following comment tag lets the administrator know that the parameters after it refer to the path settings:

```
<!-- P A T H S -->
```

To disable a feature, convert the feature's tag or tags to a comment. Rather than converting each tag to a comment, you can place the comment's begin tag in front of the feature's first opening tag, and the comment's end tag after the feature's closing tag:

```
<!-- The following feature is commented out
  ...feature lists and tags here...
-->
```

> **Warning!** Do not nest comment tags within other comment tags.

List Tags

Lists are used for instructions that have several parts, such as the MIME types or the multicast instructions. A list tag is followed by one or more list tags or variable tags. The list tag uses the following syntax:

```
<List Name="name">
...
</List>
```

Here, *name* is the list title. Using the correct capitalization for *name* is important.

Other lists or variables follow the list. The `</List>` tag signifies the end of the list. If other lists are inside the original list, they must also have closing `</List>` tags. The `MIMETypes` list is an example of a list that contains other lists.

> **Tip:** Indenting list items is not required, but is recommended for clarity.

Variable Tags

Variable tags use the following syntax:

```
<Var name="value"/>
```

Here, *name* is the variable name, and *value* is a string or a number, depending on the variable. Capitalization for both *name* and *value* is important. Unlike lists, variables do not have a closing tag; instead, a forward slash mark (/) appears before the closing angle bracket (>).

Variables can be independent elements (such as `LogPath`), or they may appear inside a list. When variables appear within a list, their meaning is determined

by the value of the list name, even though they may appear identical in syntax to variables that are not inside lists. If there are multiple variables within a list that do similar things, their names must be unique. For example, the `Extension` variables within each `MIMETypes` list must have different names. This is accomplished by adding a number to the end of each, such as `Extension_01`, `Extension_02`, and so on.

> **Tip:** If you've restarted Helix Universal Server and it's not responding to a change you've made to a variable, make sure the variable has a closing forward slash mark, and that there is no space between them.

Helix Universal Server Restart

You typically need to restart Helix Universal Server, as described in "Restarting Helix Universal Server" on page 48, after you modify the configuration file manually. If you change the Helix Universal Server file manually on a UNIX computer, you can use `SIGHUP` to upload the changes to Helix Universal Server without breaking any open connections, as long as the changes do not require a full server restart. To have Helix Universal Server re-read the configuration file, use the following `SIGHUP` command:

```
kill -HUP processID
```

in which *processID* is the Helix Universal Server process number, as shown in the `Logs/rmserver.pid` file. For more on this, see "Process ID (PID)" on page 43.

> **Tip:** Helix Administrator indicates when changes require a full restart. Use it as your guide to changes that you can and cannot upload with `SIGHUP`.

APPENDIX

B

ADDRESS SPACE BIT MASKS

In a number of Helix Universal Server features, you can identify a range of IP addresses by assigning a bit mask to an IP address. Helix Universal Server interprets the bit mask as a single, contiguous block of address spaces. This appendix describes how to create a bit mask for the purpose of identifying a range of IP addresses.

Understanding Basic IP Address Construction

To understand how bit masks work, it is helpful to review the basic concepts for constructing an IP address. Each IP address is 32 bits, divided into four 8-bit octets. Each bit in an octet is assigned a value between 128 and 1, from left to right. To indicate whether a value is in use, the bit is set to 1. The sum of all bit values for each octet determines the octet's dotted decimal value. The following defines values for each bit in an octet:

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
Bit Value:	`128`	`64`	`32`	`16`	`8`	`4`	`2`	`1`

It is possible to make any number between 0 and 255 simply by indicating whether each bit in an octet is set to 1 or 0. For example, both of the following expressions indicate the same IP address:

dotted decimal:	`192.0.1.2`
32-bit binary equivalent:	`11000000 00000000 00000001 00000010`

Using a Bit Mask to Identify an Address Space

To indicate a range of IP addresses, you must first identify the *lowest* IP address in your range, and then indicate the number of bits that are identical between that address and the highest IP address in the range. Consider the range of IP addresses `192.0.1.255` to `192.0.1.0`.

These two addresses indicate a range of 256 possible address (in practice only 254, because the all-zero and all-one addresses are reserved). Between the two indicated addresses, 192.0.1.0 is the lowest in the range, and the first three octets (the first 24 bits) are exactly the same for both addresses. Consider the following addresses and the bit mask expressed in binary.

Addresses and Bit Mask

Address and Mask	Dotted Decimal	32-Bit Binary Equivalent
Highest Address	192.0.1.255	11000000 00000000 00000001 11111111
Lowest Address	192.0.1.0	11000000 00000000 00000001 00000000
Bit Mask	24 Bits	11111111 11111111 11111111 00000000

Notice that the first 24 bits in the highest and lowest addresses are exactly the same. The same would be true if you had used an address with any decimal number (0-255) in the last octet. The bit mask uses 1's to indicate bits to be evaluated, and 0's to indicate bits to be masked. Thus, assigning a bit mask of 255.255.255.0 to the lowest IP address in the range indicates an address space of 256 possible IP addresses.

Slash Notation

In the preceding table, the bit mask appears in both its dotted decimal and 32-Bit binary form. However, this same address space can also be articulated with *slash notation* like this:

```
192.0.1.0/24
```

Slash notation uses the lowest IP address in the range, followed by a slash and a number that indicates how many bits should be evaluated. This is helpful to understand because in Helix Universal Server you indicate a bit mask in a similar manner. You select the number of bits—from 0 bits through 32 bits—from a pull-down list.

Address Space Size

The size of the address space is determined by the number of bits included in the bit mask. The fewer bits used, the more addresses that are included in the address space. An 8-bit mask includes 2^{24} power addresses, while a 24-bit mask includes only 2^{8} power addresses.

Bit Boundaries

Bit boundaries also affect which address can be included in an address space. To understand how bit boundaries work, recall that each octet includes 8 bits, and that each bit has an assigned value. Ranges correspond to the value of each bit in an octet. Further, these ranges cannot cross bit boundaries. Consider the following addresses:

Bit Boundary with an Inappropriate Mask

Address and Mask	Dotted Decimal	32-Bit Binary Equivalent
Highest Address	192.0.0.2	11000000 00000000 00000000 00000010
Lowest Address	192.0.0.1	11000000 00000000 00000000 00000001
Bit Mask	31 Bits	11111111 11111111 11111111 11111110

Although there are only two consecutive addresses in the range shown in the preceding table, you cannot create a range of two with these addresses, because bit 31 is different for each address. This is a bit boundary. To create a range for these addresses, use the sixth bit in the fourth octet, or a bit mask of 30. Note, though, that by using 30 bits, you also end up including more addresses:

Bit Boundary with an Appropriate Mask

Address and Mask	Dotted Decimal	32-Bit Binary Equivalent
Highest Address	192.0.1.3	11000000 00000000 00000001 00000011
	192.0.1.2	11000000 00000000 00000001 00000010
	192.0.1.1	11000000 00000000 00000001 00000001
Lowest Address	192.0.1.0	11000000 00000000 00000001 00000000
Bit Mask	30 Bits	11111111 11111111 11111111 11111100

Determining Bit Boundaries

The chart below identifies every literal bit range available. Look up the bit for the octet you are working with in the **Bit** column on the left. Then use the corresponding **Literal Bit Range** column to look up the decimal values available for each range.

For example, the problem described above arose from attempting to use bit 7 in the fourth octet (Bit 31). However, in row 7 of the table below, no range includes decimal 1 through 2. For a range that works, you need to use the

sixth bit in the fourth octet (Bit 30). Notice that in row 6, there is a decimal range that includes 1 through 2 (range 0-3).

Literal Bit Ranges

Bit	Literal Bit Ranges
1	Ranges of 0-127; or 128-255
2	Ranges of 0-63; 64-127; 128-191; or 192-255
3	Ranges of 0-31; 32-63; 64-95; 96-127; 128-159; 160-191; 192-223; 224-255
4	Ranges of 0-15; 16-31; 32-47; 48-63; 64-79; 80-95; 96-111; 112-127; 128-143; 144-159; 160-175; 176-191; 192-207; 208-223; 224-239; 240-255
5	Ranges of 0-7; 8-15; 16-23; 24-31; 32-39; 40-47; 48-55; 56-63; 64-71; 72-79; 80-87; 88-95; 96-103; 104-111; 112-119; 120-127; 128-135; 136-143; 144-151; 152-159; 160-167; 168-175; 176-183; 184-191; 192-199; 200-207; 208-215; 216-223; 224-231; 232-239; 240-247; 248-255
6	Ranges of 0-3; 4-7; 8-11; 12-15; 16-19; 20-23; 24-27; 28-31; 32-35; 36-39; 40-43; 44-47; 48-51; 52-55; 56-59; 60-63; 64-67; 68-71; 72-75; 76-79; 80-83; 84-87; 88-91; 92-95; 96-99; 100-103; 104-107; 108-111; 112-115; 116-119; 120-123; 124-127; 128-131; 132-135; 136-139; 140-143; 144-147; 148-151; 152-155; 156-159; 160-163; 164-167; 168-171; 172-175; 176-179; 180-183; 184-187; 188-191; 192-195; 196-199; 200-203; 204-207; 208-211; 212-215; 216-219; 220-223; 224-227; 228-231; 232-235; 236-239; 240-243; 244-247; 248-251; 252-255
7	Ranges of 0-1; 2-3; 4-5; 6-7; 8-9; 10-11; 12-13; 14-15; 16-17; 18-19; 20-21; 22-23; 24-25; 26-27; 28-29; 30-31; 32-33; 34-35; 36-37; 38-39; 40-41; 42-43; 44-45; 46-47; 48-49; 50-51; 52-53; 54-55; 56-57; 58-59; 60-61; 62-63; 64-65; 66-67; 68-69; 70-71; 72-73; 74-75; 76-77; 78-79; 80-81; 82-83; 84-85; 86-87; 88-89; 90-91; 92-93; 94-95; 96- 97; 98-99; 100-101; 102-103; 104-105; 106-107; 108-109; 110-111; 112-113; 114-115; 116-117; 118-119; 120-121; 122-123; 124-125; 126-127; 128-129; 130-131; 132-133; 134-135; 136-137; 138-139; 140-141; 142-143; 144-145; 146-147; 148-149; 150-151; 152-153; 154-155; 156-157; 158-159; 160-161; 162-163; 164-165; 166-167; 168-169; 170-171; 172-173; 174-175; 176-177; 178-179; 180-181; 182-183; 184-185; 186-187; 188-189; 190-191; 192-193; 194-195; 196-197; 198-199 200-201; 202-203; 204-205; 206-207; 208-209; 210-211; 212-213; 214-215; 216-217; 218-219; 220-221; 222-223; 224-225; 226-227; 228-229; 230-231; 232-233; 234-235; 236-237; 238-239; 240-241; 242-243; 244-245; 246-247; 248-249; 250-251; 252-253; 254-255
8	Only an exact match is possible.

Working with 0-Bit and 32-Bit Masks

There are two masks that create somewhat special cases: 0-Bits and 32-Bits. When an IP address has a 32-Bit mask, it creates a literal range of 1. For example, consider the following address and 32-Bit mask:

```
192.0.1.1 /32
```

When Helix Universal Server evaluates incoming IP addresses against this IP address, there is only one possible match: `192.0.1.1`. For a match, the incoming address must match all 32-Bits in the original address.

Just as there is only one possible match for addresses with a 32-Bit mask, the opposite is true for addresses with a 0-Bit mask. An IP address with a 0-bit mask essentially tells Helix Universal Server to match any addresses. Although not required, you should also enter an origin address of all zeros, like so:

```
0.0.0.0 /0
```

This works because Helix Universal Server uses a Boolean *and* operation to evaluate incoming addresses. In this type of algorithm, anything and zero equals zero, so all incoming addresses end up equal to the all-zero address entered as the origin address.

APPENDIX

C

AUTHENTICATION DATA STORAGE

After Helix Universal Server has authenticated user access, it can check whether the user has permission to view specific clips or directories. You can use this information for applications such as pay-per-view. Permission information is stored in a separate database, and this appendix describes the data storage methods that you can use with the authentication feature.

Understanding Authentication Data

To authenticate visitors, the Helix Universal Server stores user IDs and passwords or client IDs, and their associated access permission information. When a client tries to access a clip, the Helix Universal Server looks up this information to see whether the client or visitor is authorized to view the clip. The information can be stored in either a series of text files or in a database. Templates for common databases are installed during installation.

This section describes the methods for storing user name and password data. Templates for common databases are created during installation, that correspond to the database types listed in "Supported Database Types" on page 263.

- **Text file storage**—this default method uses a combination of directory structure and text files to achieve a sensible data storage method. See "Using Text Files" on page 392 for details.
- **Database templates**—the supplied templates use a structure similar to the text file method, in a more familiar database format. Refer to "Using a Database" on page 396 for more information.

Using Text Files

The default configuration uses the text file storage method to provide storage for all default realms. The following directories contain the text files which store data. The center letter indicates the authentication protocol: r is for RealSystem 5.0, b is for Basic.

Supplied Data Storage Directories

Directory Name	Information Stored
enc_b_db	encoder user authentication for Helix Producer
enc_r_db	encoder user authentication for RealProducer G2 through 8.5
adm_b_db	Helix Administrator user authentication
con_r_db	content authentication

The following table describes the contents of these directories.

Text File Storage Directory Structure

Directory	Contents	File or Directory Description
Main directory (con_r_db, enc_b_db, enc_r_db, or adm_b_db)	ppvbasic.txt	The text file indicates to Helix Universal Server that this is the storage area for the list of authenticated names.
users	(initially blank)	Files in this directory list the clips and permission types.
guids	(initially blank)	For player validation, files connect the clientID with a user name.
logs	reglog.txt accesslog.txt	See below for a description of these files.
redirect	(initially blank)	For player validation, files contain an URL to which to send the client if redirection is necessary.

The actual data storage text files do not exist when Helix Universal Server is first installed. They are created when authentication is in use, and secure content is first requested. When Helix Universal Server creates the file structure, it creates the ppvbasic.txt file. Helix Universal Server looks for this file the second and subsequent times you start it. If the file does not exist, it recreates the directory structure.

Warning! Do not delete the `ppvbasic.txt` file! If you delete the `ppvbasic.txt` file, Helix Universal Server will rewrite the directories and erase their prior content.

Users Directory

The files in this directory are named *username*, where *username* is the user name. This directory contains one file per registered user. The first line of each file has the following format and is different than subsequent lines in the file:

password;uuid;uuid_writeable

Field	Description
password	When user authentication is in use, this stores the password. Otherwise shows an asterisk (*). Passwords are encrypted. See “Using the Password Tool” on page 261.
uuid	In player validation, stores playerID. In user authentication, an asterisk (*) appears in this field.
uuid_writeable	A flag set and used by Helix Universal Server: 0–playerID is in database 1–record created, but playerID is not yet registered

The second and subsequent lines of each file have the following format. For further detail on allowable values in each field, see table “Permission Types” on page 272:

url;url_type;permission_type;expires;debitted_time

Field	Description
url	URL of secure directory or clip.
url_type	Whether URL is directory or clip: 0–clip 1–directory
permission_type	Permission type associated with access.
expires	If *permission_type* is 1, this is the expiration date/time, in format `MM/DD/YYYY:HH:MM:SS`. Otherwise blank.
debitted_time	If *permission_type* is 2, this is time remaining in seconds. If *permission_type* is 3, this is the number of seconds of material the visitor has viewed. Otherwise, it is blank.

The example file, user1, has the following content, when player validation is in use:

```
*;00001d00-0901-11d1-8b06-00a024406d59;0
Secure/clip1.rm;0;0;*;*
Secure/directory;1;0;*;*
Secure/time.rm;0;2;*;300;*
Secure/time.rm;0;1;05/24/1970:06:12:32;300;*
```

Note: If you manually edit the files, be sure that any blank or unused fields use an asterisk (*) as a placeholder. Do not use a space for a placeholder.

Guids Directory

The files in this directory are given the names of the unique client IDs from the registered clients, one per registered user. Each file contains only the name of the associated user name. For example, a file such as 00001d00-0901-11d1-8b06-00a024406d59 contains the name of the user, user1.

Logs Directory

This directory contains two files: reglog.txt and accesslog.txt.

reglog.txt

Each line of reglog.txt represents the result of an attempt to register a visitor. This file has the following format:

status;userid;uuid;IP;register_time;url_redirect

Field	Description
status	Result of user's attempt to connect: 0–Success 1–Failed (clientID not readable) 2–Failed (clientID already used) 3–Failed (RealAudio Player 3 or older) 4–No user (Must be entered previously in the database) 5–General failure
userid	Unique name of up to 50 characters.
uuid	clientID.
IP	IP address from which user is attempting to connect.

(Table Page 1 of 2)

Field	Description
request_time	Time of connection request.
url_redirect	If connection failed, URL to which user was redirected (see `redirect.txt`).

(Table Page 2 of 2)

accesslog.txt

Each line of `accesslog.txt` describes the result of an attempt to view a clip. This file is not created until authentication is enabled and the first user attempts to connect:

status;userid;uuid;ip;url;access_type;permission_on;start_time;end_time;total_time;why_disconnect

Field	Description
status	Result of user's attempt to connect: 0–access to clip granted 1–denied
userid	Unique name of up to 50 characters.
uuid	Stores player ID.
ip	IP address from which user is attempting to connect.
url	Secured clip user is attempted to access.
access_type	Permission type associated with access. See the table "Permission Types" on page 272 for values.
permission_on	Permission type associated with URL: 0–file (individual clip) 1–directory 2–none
start_time	Time/date clip started playing.
end_time	Time/date clip stopped playing.
total_time	Total time clip played.
why_disconnect	Reason for disconnection: 0–client disconnected voluntarily 1–server access expired

Redirect Directory

Used only in player validation, the `redirect` directory contains files named after URLs that are restricted from unauthorized users. Within each file is the alternate URL to which Helix Universal Server sends the user if he or she tries to click the restricted URL. If no files are present in this directory, and the user attempts to click a URL to which he or she has not been given access, the user receives an error message.

Because certain characters that appear in URLs are illegal in file names, Helix Universal Server requires a substitution for these illegal symbols.

Substitutions

Character	Replacement Sequence
/	`+2f`
\	`+2b`
+	`+5c`

For example, the URL `Secure/TopSecret.rm` would be converted to `Secure+2fTopSecret.rm`. The URL within each file, however, is represented normally.

Using a Database

This section describes the structure of the database templates included with Helix Universal Server. To set up the database, see "Setting Up Other Types of Data Storage" on page 399. The database templates include five tables:

- **Users table**—Together with the permissions table, contains the lists of who is registered and with what access.
- **Permissions table**—Linked to the users table, lists specific clips and directories and the permissions associated.
- **Register_log table**—Used if player validation is in use, it tracks the clientID.
- **Redirect table**—Used in player validation only.
- **Access_log table**—Used by the commerce feature.

Users Table

Gives the list of user names and passwords.

Users Table

Field	Description
userid	User name of up to 50 characters. Ties to permissions table.
password	In user authentication, this stores the password. Otherwise blank. Passwords are encrypted.
uuid	In player validation, stores clientID. In user authentication, an asterisk (*) appears in this field.
uuid_writeable	A flag set and used by Helix Universal Server: 0–clientID is in the database 1–the record has been created but the clientID is not yet registered with Helix Universal Server.

Permissions Table

Linked to the users table through the userid, this identifies the specific clips or directories and the type of access for each.

Permissions Table

Field	Description
userid	User name of up to 50 characters. Ties to Users table.
url	URL of secure directory or clip.
url_type	Whether URL is directory or clip: 0 clip 1 directory.
permission_type	Permission type associated with access.
expires	Permission expiration date and time, in format `MM/DD/YYYY:HH:MM:SS`. Used only if *permission_type* is 1 (dated). Otherwise blank.
debitted_time	If `permission_type` = 2 (countdown), this is the number of seconds remaining. If `permission_type`=3 (countup), this is the number of seconds of material the visitor has viewed. Otherwise, it is blank.

Register_Log Table

The register_log table is used only if player validation is in use (indicated by `UseGUIDValidation=True`).

Register_log Table

Field	Description
status	Result of user's attempt to connect: 0–Success 1–Failed (clientID not readable) 2–Failed (clientID already used) 3–Failed (RealAudio Player 3 or older) 4–No user (Must be entered previously in the database) 5–General failure
userid	Unique name of up to 50 characters.
uuid	Stores clientID.
ip	IP address from which user is attempting to connect.
request_time	Time of connection request.
url_redirect	If connection failed, URL to which user was redirected (see Redirect Table, above).

Redirect Table

The redirect table is only used in player validation.

Redirect Table

Field	Description
url	URL of any secure clip or directory.
url_redirect	URL to which users could be redirected to if they are not allowed access to that clip. New URL must **not** be a secure URL.

Access_log Table

Used by the commerce feature to show which secure content has been accessed.

Access_log Table

Field	Description
status	Result of user's attempt to connect: 0–access to clip granted 1–denied
userid	Unique name of up to 50 characters.
uuid	Stores player ID.
ip	IP address from which user is attempting to connect.
url	Secured clip user is attempted to access.
permission_type	Permission type associated with access. See the table "Permission Types" on page 272 for values.
permission_on	Permission type associated with url: 0–file (individual clip) 1–directory 2–none
start_time	Time/date clip started playing.
end_time	Time/date clip stopped playing.
total_time	Total time clip played.
why_disconnect	Reason for disconnection: 0–client disconnected voluntarily 1–server access expired

Setting Up Other Types of Data Storage

Support for two types of databases is included.

➤ To set up your Windows computer for ODBC compliance:

1. On the **Start** menu, point to **Settings**, and click **Control Panel**.
2. Double-click **32bit ODBC.**
3. On the **System DSN tab**, click **Add**.
4. Select your ODBC driver from the list of drivers and click **Finish**.

5. In the **ODBC SQL Server Setup** dialog box, type the data source name. Click **Select**.
6. Type or browse for the path to your database file and click **OK**.
7. Click **OK** to exit the ODBC Data Source Administrator.

You must now tell Helix Universal Server where to find your database.

➤ To set up the supplied database application on UNIX:

1. At a command line, start the database by typing the following:

   `./msql2d &`

2. Create the database by typing the following:

   `./msqladmin create` *databasename*

3. Note that whatever you type for *databasename* will need to match the database cited in the Databases list.
4. Create the tables using the database text file by typing the following:

   `.msql -h` *localhost databasename* `< ppvdemo.db`

   Be sure to include the less-than sign (<).

INDEX